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ABSTRACT

Strategic planning for an Integrated Academic Information Management System (IAIMS) for Georgetown University Medical Center is considered. The goal is to organize and transmit accessible and timely biomedical information where it is needed. Activities are proposed for education, research, patient care, management, sharing information on applications, medical informatics, IAIMS conferences, and cooperative efforts. An IAIMS leadership and organization plan is outlined, along with functional goals for medical center divisions (e.g., medicine, dentistry). Also covered are: network system implementation; information flow; resources needed to implement IAIMS, timetable for the 10-year implementation plan; accomplishments and problems encountered in planning, the self-study, and the implementation plan. Environmental forecasting for patient care, education, research, management, information access, and technology are addressed. An institutional self-study covers existing technology capabilities and information management goals and requirements. Appendices following volumes 1 and 4 include: information on affiliated hospitals and health centers; IAIMS project participants and advisory board members; self-study survey of automated systems, interview schedule, and sample reports. (SW)

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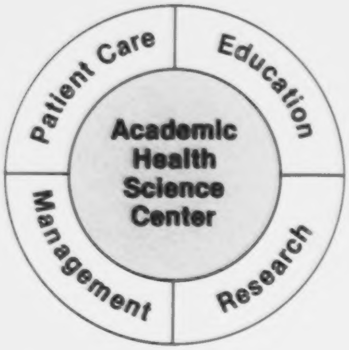
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Strategic Planning: An Integrated Academic Information Management System (IAIMS) at Georgetown University Medical Center

Naomi C. Broering
Principal Investigator

Volume 1	**IMPLEMENTATION PLAN**
Volume 2	**PLANNING ACCOMPLISHMENTS** *Naomi C. Broering*
Volume 3	**ENVIRONMENTAL FORECAST** *Pauline Mistry*
Volume 4	**INSTITUTIONAL SELF STUDY** *Helen E. Bagdoyan*

Georgetown University Medical Center
Washington, DC
1986

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INTEGRATED ACADEMIC INFORMATION MANAGEMENT SYSTEM (IAIMS)

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Preface

The Georgetown University Medical Center plan for an Integrated Academic Information Management System (IAIMS) is presented in four volumes. It begins with the Implementation Plan as the first volume. The reason for this unusual arrangement is to provide concrete information at the onset and to give prominence to the path Georgetown plans to undertake in the next decade.

The four volumes cover the entire planning process at Georgetown during a two year period. These volumes represent a condensed version of the planning documentation accumulated. The volumes are organized as follows:

Volume I. Implementation Plan. This primary work includes the recommendations and outcomes of the planning project. It traces a general course of action to be followed by the Medical Center including programmatic and technical aspects to be addressed during the ten year implementation phases.

Volume II. Planning Accomplishments. This brief volume chronicles and summarizes the achievements of the planning groups and describes the numerous tasks undertaken to develop the plan.

Volume III. Environmental Forecast. Of utmost importance are the internal and external forces that impact the Medical Center. Essential also are the unendlessly changing and developing trends in technology, health sciences education, research and patient care. These critical factors are summarized in this concise but valuable document.

Volume IV. Institutional Self Study. To plan effectively, the Medical Center needed an up-to-date analysis of its human and technical resources. This major volume includes a series of self studies of the resources relating to implementing IAIMS at the Medical Center. It not only documents the hardware, software and human resources, but includes a needs analysis and an information policy which provides a skeletal framework for issues addressed in the plan.

This work, funded in part by a National Library of Medicine contract and by the Dahlgren Memorial Library, Georgetown University Medical Center, is available to other institutions interested in the IAIMS concept.

Naomi C. Broering

Principal Investigator

Acknowledgements

This IAIMS Implementation Plan for the Georgetown University Medical Center is the culmination of a year and a half of strategic planning, undertaken by a dedicated group of over sixty senior faculty and administrators from the Schools of Medicine, Dentistry and Nursing, the University Hospital, the Library and the Chancellor's Office. It is with great pleasure and special appreciation that I recognize the innumerable contributions of the individuals from all levels of the Medical Center who participated in the project. They include the Chancellor, the Deans of the Schools, the Hospital Administrator, the Medical Director, the Executive Faculties of the Schools and senior faculty, librarians and administrative staff. Valuable input has also been provided by students and general faculty.

This highly complex project would not have been possible without the dedication of the four IAIMS planning teams: the Development, Technical, Information and Financial Teams. The IAIMS Development Team, with representation from each major unit, was assigned the key responsibility for preparing the IAIMS Implementation Plan. This team, chaired by the IAIMS Principal Investigator, is comprised of over 15 senior faculty and staff of the Medical Center. The Technical, Information and Financial Teams, whose members were chosen for their professional expertise, were delegated specific planning tasks. The Technical Team, chaired by Donald Segal, Assistant Administrator for Systems, includes six technically skilled individuals. The Information Team, consisting of eight members responsible for the Self Study, is chaired by Helen Bagdoyan, Assistant Librarian for Public Information Services, to whom I am greatly indebted. Four financial specialists from each of the Medical Center units and the Development Office comprised the Financial Team, chaired by John Greenbaum, Assistant Chancellor for the Division of Finance and Business. The entire list of Georgetown participants is included in Appendix C.

Numerous hours were spent in preparing, critiquing and proofreading this manuscript. I would like to especially thank Pauline Mistry, Director of Planning, Office of the Chancellor, for her ideas and valuable suggestions and for writing the Environmental Forecast.

A number of special services were required during the planning process that necessitated external support. Georgetown is indebted to the consulting firms of University Associates and Sigma Associates for the special services they provided the IAIMS Teams throughout the planning period. The graphics for figures, tables and charts were provided by the Educational Media Department of the Georgetown University Medical Center and by Ampersand (&) Imaging, Inc. of Vienna, Virginia.

Lastly, but of major importance, this manuscript would not have reached its final form without the special dedication of Julie M. Ross who prepared and edited this manuscript.

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IAIMS Implementation Plan

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Executive Summary

This ten year implementation plan leading to an institution-wide Integrated Academic Information Management System (IAIMS) has been developed as a guideline for academic information management at the Georgetown University Medical Center. The plan includes the latest thinking of a number of knowledgeable Medical Center leaders charged with devising a visionary and logical approach for implementing an IAIMS suitable for Georgetown. It is an ambitious, strategic plan designed to address current as well as future information needs of the Medical Center as it strives for excellence in educating health professionals for the 21st Century. IAIMS is a major Medical Center endeavor of immense significance requiring multi-million dollar expenditures to implement.

During the process of implementing IAIMS over a ten year period, the Medical Center will move through three stages of Technological Development. To reach Stage 1 (Substitution), transfer from paper-based systems to computer-based systems must be achieved. During Stage 2 (Innovation), new information services previously unavailable will be made possible. In Stage 3 (Transformation), a total change will occur in the way information is handled. There will be an unconscious awareness and emergence of new knowledge. When this occurs the Medical Center will have created a new medium for the pursuit of intellectual excellence.

The Medical Center has established two major goals for providing state-of-the-art medicine and for making biomedical information more accessible through IAIMS.

The first goal is to improve the transfer of information and utilization of recorded knowledge by developing a network system to support the programs of the Medical Center. This goal will be achieved through four objectives addressing the flow of information for education, patient care, research and management functions. The objectives include some of the following tasks:

1. To "pull together" academic information required to conduct Medical Center functions so access to shared databases is available to users from multiple sites.
2. To provide an interface to the existing databases of the Library and Hospital systems which include bibliographic information, recorded knowledge, patient data, laboratory results, and pharmacy and x-ray reports.
3. To develop new databases in pilot projects and make them available in a natural progression through IAIMS.
4. To automate functions in a logical step by step approach. A series of projects begun as "pilots" will be implemented during a ten year period until all the units and departments of the Medical Center are automated.
5. To create clusters of intradepartmental microcomputer workstations as "mini" networks and to provide access to shared databases in the IAIMS network.
6. To establish an Academic Information Management Center (AIMC) in the Library for use by students and faculty.
7. To develop a distributed database system which transparently links heterogeneous databases via a sophisticated communications network. The IAIMS Local Area Network (LAN), will be the initial element of a backbone transmission system. The LAN will also be linked to a University digital PBX system through gateways by logical and physical

protocol conversion. The campus-wide telecommunications system will utilize fiber optics to facilitate transmission of data, voice, and ultimately, video.

The second goal is to become a "Center of Excellence," a prototype IAIMS, to serve as a national resource for other academic health sciences centers and to engage in research and demonstrations on use of advanced technologies in the health field. The outcomes of the four major objectives in this goal are intended to be beneficial to the nation's other medical centers that are planning IAIMS programs. They include:

1. Sharing information on applications software.
2. Contributing to further development and utilization of medical informatics.
3. Sponsoring and participating in conferences on IAIMS.
4. Engaging in consortial activities with others developing IAIMS prototypes.

The distributed system approach adopted by the Medical Center preserves the current databases and data processing systems of each unit. The IAIMS services will supplement these systems through integration and interface of major resources through a network of micro, mini and mainframe systems for Medical Center-wide access. Each unit of the Medical Center has developed functional goals for information management that relate to and are consistent with IAIMS.

In its strategic planning process, Georgetown has incorporated a three-phased approach for the establishment, implementation and ongoing enhancement of the IAIMS: Pilot (1-3 years); Interim (3-5 years); and Long-Range (5-10 years). The Pilot Phase will begin by installing a LAN for approximately 50 workstations in the first year and building up to approximately 1,000 in the third year. In the Interim Phase, the program will expand to allow access throughout the entire Medical Center wherever terminals or computers are available. The Long-Range Phase will ultimately extend access to external sites, including community health practitioners local hospitals and academic medical centers affiliated with or participating in consortial arrangements with Georgetown University.

A number of programmatic objectives are planned during the three phases. During the Pilot Phase, approximately eleven programs will be addressed. One such program is the Model Development Project which includes a neurosciences model experiment, a clinical problem-solving educational component, an administrative component, installation of the network and launching of the Academic Information Management Center in the Library. IAIMS core support services are required to maintain the system throughout the three phases. During the Interim Phase many of the core services and ongoing programs will continue. However, new projects and experiments that utilize advanced technologies will be incorporated in this phase. During the Long Range Phase a number of innovative applications resulting from research activities in Medical Informatics and IAIMS projects will emerge. Attention throughout these phases will be given to developing the ideal workstation of the future, utilizing new expert systems and applying a unified medical language as it becomes available.

The raison d'etre for IAIMS, of course, is to enhance patient care by organizing information so it is more accessible by health workers. This information is comprised of varying types of databases such as bibliographic, patient records, educational systems, expert systems and administrative data. What Georgetown hopes to achieve is a logical merger of these databases, whenever possible, so redundancy is eliminated and access is facilitated.

The plan will serve as a framework, and the timetable represents a reasonable path to be followed which is dependent, of course, on availability of funds and technical advances. Although one or the other factors could accelerate or delay the implementation schedule, the plan provides a valuable strategic and tactical guideline for coping with management of information in the future.

The plan proposed by Georgetown is only one approach for creating an IAIMS prototype. Other institutions with different capabilities will develop divergent IAIMS. Organizational and technical aspects will probably be very different at each institution. Nevertheless, it is hoped that the aggregate plans of all the current IAIMS centers will contribute useful information to the National Library of Medicine (NLM) and individual assistance to those institutions planning future integrated systems. It is with this intent that Georgetown submits this strategic plan to the NLM.

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Volume 1: IMPLEMENTATION PLAN

Naomi C. Broering

Introduction 13
The Georgetown University Medical Center 13
IAIMS Implementation Plan: Background 15
IAIMS Implementation Plan 23
IAIMS Implementation: Organization 28
Implementing IAIMS at the Medical Center Units 31
Plans for Implementing the Network System* 46
Resource Requirements 63
Funding Sources 66
Overall Timetable 68
Evaluation 77
Conclusion 80
Bibliography 82
Appendices 87

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*Technical Plans for the Network System were prepared by Sigma Associates, McLean, Virginia, as a subcontract.

Table of Contents

INTRODUCTION 13

THE GEORGETOWN UNIVERSITY MEDICAL CENTER 13
Mission.
Description of the Medical Center.

IAIMS IMPLEMENTATION PLAN: BACKGROUND 15
Planning Process and General Strategies.
Environmental Forecast Summary.
Information Policy Summary.
Self Study Inventory and Analysis.
Needs Assessment Summary.
  Information Use Scenarios.
  System Functional Requirements.

IAIMS IMPLEMENTATION PLAN 23
Ten Year Goals and Stages of Development
The First Goal—Academic Information Management Objectives:
  Education.
  Patient Care.
  Research.
  Management.

The Second Goal—Excellence Objectives:
  Share Information on Applications Programs.
  Medical Informatics and Expert Systems.
  Conferences on IAIMS.
  Consortial Activities.

IAIMS IMPLEMENTATION: ORGANIZATION 28
The Chancellor of the Medical Center.
IAIMS Program Manager.
Assistant Chancellor for Information Resources.
Medical Center Management Committee.
Liaison with University and Affiliates.
Medical Center Computer Committee.
IAIMS Users Committee.
Position Description.

IMPLEMENTING IAIMS IN THE MEDICAL CENTER UNITS: FUNCTIONAL PLANS .. 31
The School of Medicine
The School of Dentistry
The School of Nursing
The University Hospital
The Academic Information Management Center and the Medical Center Library
The Office of the Chancellor of the Medical Center

PLANS FOR IMPLEMENTING THE NETWORK SYSTEM 46
Background and the Baseline.
  IAIMS Architecture.
  System Implementation Plan.
  Ongoing Activities on Policy, Organization and Process.

The Implementation Phases of IAIMS
  Considerations and Characteristics of Implementation Phases.
  Long Range Phase.
  Interim Phase.
  Pilot Phase.
  IAIMS Impact on Medical Center Operations.

Implementing the Network System.
  Overall System Architecture.
  Considerations and Trade-Offs.
  Distributed System.
  Network Considerations.
  Conclusions Concerning IAIMS Architecture.
  The IAIMS Architecture: Telecommunications System.
  Other Related Enabling Mechanisms.

  Summary of Network.
  Profile of Network Usage Requirements.
  Schedule and Activities of Network System:
    Key Assumptions.
    Schedule for Implementing the Network.
    Progress of the Campus Telecommunications System.

RESOURCE REQUIREMENTS FOR IAIMS IMPLEMENTATION 63
Key Assumptions for Resource Requirements.
Volume Drivers and Cost Estimates.
Human Resources—Staffing Assumptions.
Academic Information Management Center.
Comments and Summary.

FUNDING SOURCES FOR IAIMS IMPLEMENTATION 66
Federal Agencies.
Industry.
Foundations.
Revenue.
Cost Sharing.

OVERALL TIMETABLE FOR IMPLEMENTING THE IAIMS PROGRAMS AND NETWORK SYSTEM 68
IAIMS Program Objectives: The Three Phases

EVALUATION OF IAIMS 77

CONCLUSION 80

BIBLIOGRAPHY 82

APPENDICES

Figures

1. Key IAIMS Planners 15
2. IAIMS Network 16
3. Overall Schedule—IAIMS Implementation 17
4. IAIMS Organization Chart 30
5. Flow of Information Through IAIMS at the Medical Center 32
6. The School of Medicine 34
7. The School of Dentistry 36
8. Computers in the Curriculum Model 37
9. Computers in the Curriculum Model Structure 38
10. The School of Nursing 38
11. The Hospital Information System 39
12. The University Hospital 41
13. The Academic Information Management Center 43
14. The Library and Academic Information Management Center 44
15. AIMC Phase I Floor Plan 45
16. AIMC Group Study Rooms Floor Plan 45
17. The Chancellor's Office 46
18. IAIMS Program—Overall Schedule 48
19. Interim IAIMS Overall Information Flow 50
20. Overview of Pilot Information Flow 52
21. Dahlgren Memorial Library Pilot Information Flow 53
22. Dahlgren Memorial Library Current Information Flow 54
23. Operational Aspects of Medical Center Operations 54
24. IAIMS Long Term Architecture 57
25. IAIMS Usage Requirements 58
26. Pilot IAIMS Architecture 59

27. Interim IAIMS Architecture 60

28. IAIMS—Key Assumptions Primary Information Use Scenarios for Interim IAIMS 61

29. Overall Schedule—IAIMS Implementation 63

30. Resource Requirements 64

31. IAIMS Transmission & Initial Cost Estimates 65

32. Volume Drivers for Resource Requirements 66

33. Staffing Assumptions 67

34. Timetable for IAIMS 69

35. Future Access Through IAIMS 70

36. Three Phases of the Ten Year Timetable for IAIMS 74

37. IAIMS Implementation Schedule 75

38. Developing Technologies 76

Appendices

A. Conceptualizing IAIMS: Broering Presentation at the NLM IAIMS Symposium, October 17, 1984.

B. Georgetown University Affiliations:
  Major Georgetown University School of Medicine Affiliations
  Other Georgetown University School of Medicine Affiliation Agreements
  Georgetown University School of Nursing Afffiliations
  Georgetown University School of Dentistry Affiliations
  Georgetown University Hospital Affiliations.

C. List of Participants in the IAIMS Project.

D. IAIMS Executive Advisory Board Members.

E. IAIMS Executive Advisory Board Meeting Programs.

F. Micro Day Demonstrations Program.

G. List of Institutions with Georgetown's IAIMS Planning Information.

IAIMS Implementation Plan

Patient Care
Education
Academic Health Science Center
Management
Research

Introduction

A major challenge facing the health professions in general and academic health science centers in particular is effective access to the information essential for clinical decision making and patient care management. Such information will be from multiple sources and in many formats; it could include patient laboratory test results, x-rays, patient demographic data, information on drug interactions, library materials from journals and texts, existing databases on treatment protocols and outcomes, or software programs to assist in clinical diagnosis. Effective access would be achieved if the information could be made available at the place where it is needed, when it is needed, for example in the health practitioner's office and at the patient's bedside.

The overall goal of an Integrated Academic Information Management System (IAIMS) is to organize and transmit a range of biomedical information in such a way that it is accessible in a timely manner at the place where it is required. As the amount of biomedical knowledge increases annually in geometric progression, it becomes more and more difficult for the health professions student to memorize and comprehend the vast amount of knowledge available. Faculty and researchers in clinical and basic sciences also experience similar difficulties. A truly Integrated Academic Information Management System would address both of these issues.

This IAIMS Implementation Plan, covering a ten year period, has been developed as a guideline for information management at the Georgetown University Medical Center in future years. IAIMS is viewed as a major Medical Center planning endeavor of immense significance requiring initial expenditures of approximately $25 million dollars to implement. The plan includes the latest thinking of a number of knowledgeable Medical Center leaders charged with devising a visionary and logical approach for implementing an IAIMS suitable to Georgetown. It is an ambitious, strategic plan designed to address current as well as future needs for continued excellence of the Medical Center's programs. Georgetown strives for excellence in educating health professionals that are well prepared in the use of advanced technologies and in medical informatics so they can provide quality patient care.

In October 1984, the National Library of Medicine (NLM) sponsored a symposium on "Planning for Integrated Academic Information Management Systems." Georgetown participated by presenting a paper entitled "Conceptualizing IAIMS: The Process of Definition and Policy Development at Georgetown University Medical Center." (See Appendix A.) The paper traces the elements of an IAIMS definition which includes the concept, goals, objectives, organization, policy, and functional aspects such as applications programs, computers and communications systems and user training. These multiple components are some of the building blocks considered by Georgetown in developing its IAIMS Implementation Plan.

The Georgetown University Medical Center

Mission

Georgetown University, a Jesuit institution nearly 200 years old, is committed to a tradition of liberal education, dedicated to the service of others and resolved to extend the limits of knowledge. Its programs for students in the humanities, arts, sciences and the professions examine human dignity in many contexts through their studies in the Undergraduate Colleges, Graduate School, the Law Center and the Medical Center. The University's Medical Center challenges these principles even deeper in its pursuits of the health professions' education, research, patient care and community service programs of the Schools of Medicine, Dentistry, Nursing and the University Hospital.

Description of the Medical Center

The Georgetown University Medical Center (GUMC) is comprised of five major units: the Schools of Medicine, Dentistry and Nursing, the University Hospital, and the John Vinton Dahlgren Memorial Library. The Medical Center campus has a student population of over 2,500 students.

The first professional school, that of medicine, was established in 1851. The School of Dentistry was created in 1901 and the School of Nursing followed in 1903. The University Hospital received its first patients in 1898. The campus moved to its present location from downtown Washington, D.C. around 1930 when buildings for the schools and hospital were completed. The library was developed in 1912 to support the research, education and patient care mission of the Medical Center. The existing library building is a modern structure constructed in 1970 to accommodate programs that support the print and non-print approach to information. It is a totally "electronic library" using its own internally designed integrated Library Information System (LIS).

In addition to the five major units mentioned, two other important entities of the Medical Center are the Dental Clinic and the Vincent T. Lombardi Cancer Research Center. The new Georgetown University School of Dentistry Clinic opened September 1, 1970. It is a modern four story building covering 128,160 square feet. There are large reception areas, faculty offices, demonstration and conference rooms, operatories and laboratories. Although third and fourth year students primarily utilize the clinical facilities, revisions in the curriculum now make it possible for first and second year students to also obtain access to the clinical environment. Fourteen modern x-ray rooms are available for teaching students the skills essential to the early diagnosis and treatment of dental problems. The clinic serves a dual purpose; while providing Georgetown with an abundance of patients, the clinic has also been able to provide dental care to an increasing number of Washington, D.C.'s population. It is a mutually beneficial arrangement and Georgetown is proud to continue providing quality care to the Washington, D.C. urban community.

The Vincent T. Lombardi Cancer Center was named in honor of Vince Lombardi, coach of the Green Bay Packers and the Washington Redskins, who died of cancer in the Georgetown University Hospital on September 3, 1970. Today the Lombardi Center is one of the 21 comprehensive cancer centers in the country designated by the National Cancer Institute. Both the Lombardi Center and the Georgetown University Hospital's Cancer Program are fully accredited by the Commission on Cancer of the American College of Surgeons. The Lombardi Cancer Center building, completed in 1983, accommodates ambulatory patient care and research programs in oncology.

The mission of the Lombardi Center is to provide excellence in patient care, advance cancer research, contribute through its medical school faculty to undergraduate, graduate and continuing medical education and promote community outreach and service. Its programs and activities stress an interdisciplinary approach to the study and treatment of all types of cancer. The center has a strong interdisciplinary capability with a professional staff in the clinical specialities of medical oncology, radiation medicine, surgical oncology, gynecologic oncology, pediatric oncology, interventional and therapeutic radiology and immunologic oncology.

The Medical Center is one of the major employers and health care providers in Washington, D.C. Today the University Hospital has over 500 beds and records 25,000 outpatient visits per year. The faculty consists of almost 2,000 (530 full time and over 1,400 part time) and the Medical Center employs over 2,800 full and part time staff. There are approximately 2,500 students enrolled in the health programs of the Schools of Medicine, Dentistry and Nursing and the Basic Sciences programs of the Graduate School. In addition to the student educational programs the three Medical Center schools each have active divisions of Continuing Education. These divisions provide continuing education programs for health care practitioners from all areas of the country.

In order to provide the variety of educational experiences needed for the students, the Medical Center is affiliated with over thirty-five hospitals and health care institutions in the Washington metropolitan area. Ten of these affiliations are considered "major" with Georgetown residents providing significant patient care in these affiliated institutions. The Georgetown

University Medical Center operates an extremely active University Hospital in Washington, D.C. The University Hospital is also affiliated with many community and teaching hospitals in the Washington, D.C. area in a variety of different ways. For example, mutually rotating residency programs are conducted and joint endeavors for special tertiary care arrangements are provided. A list of medical institutions and their relationship to Georgetown University is included in Appendix B.

Imminent plans of the Medical Center include construction of a new Resources Research Facility, a Clinical Sciences Building and a FIDIA-Georgetown Institute for the Neurosciences. The Hospital plans a Magnetic Resonance Imager (MRI) to enhance diagnostic work conducted in the Radiology Department. These multi-million dollar programs will generate expanded patient care services and research projects to further serve community and national health care needs.

IAIMS Implementation Plan: Background

Planning Process and General Statistics

In September 1983, the Georgetown University Medical Center (GUMC) was one of the first academic medical centers in the country awarded an NLM contract to plan for implementation of an Integrated Academic Information Management System (IAIMS).

As part of the strategic planning process undertaken during the twenty one month contract period (September, 1983 to June, 1985), Georgetown engaged in a comprehensive program to design an institution-wide IAIMS at the Medical Center. Involvement and consensus development progressed through both a top-down and bottom-up approach. To accomplish the work of this highly complex project, tasks and assignments were divided among over 60 members of Medical Center planning teams. An IAIMS Development Planning Team with representation from each unit of the Medical Center (the Schools of Medicine, Dentistry and Nursing, University Hospital, Library and Chancellor's Office) was assigned key responsibility for the development of an IAIMS implementation plan. Technical, Information and Financial Teams, whose members were chosen for their professional expertise, were delegated specific planning tasks. Consultants were selected to provide special services. (See Figure 1)

Three major planning activities were conducted:

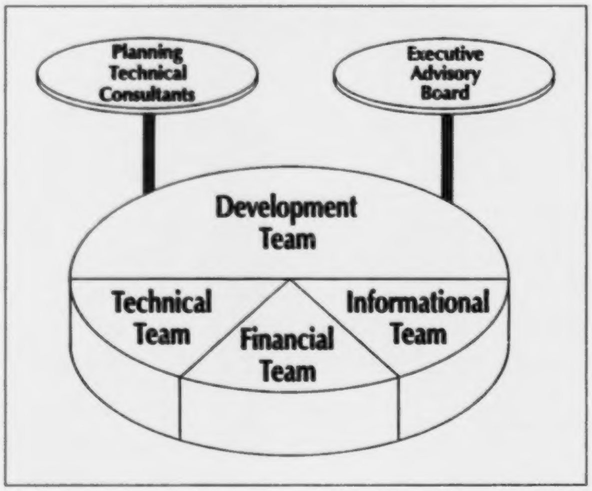
1. Implementation of a strategic planning process.
2. A series of institutional self-studies.
3. Development of an implementation plan.

All the required quarterly reports and documents were submitted to the NLM in a timely fashion. On September 25, 1984, the self study documents which included: (1) an environmental forecast; (2) a self study inventory and analysis; and (3) an information policy, were submitted to NLM. These represent an extensive report of the institution's resources, vital assumptions about the medical campus, the directions and trends in health care education and delivery for the next ten years, a needs assessment of user interests and requirements for improving electronic transfer of biomedical information, and scenarios of current and proposed information flow patterns. The information policy represented a major effort of examining existing policy with new protocols to meet future needs and merging them into one document that acknowledged commonality but also recognized differences when appropriate.

Once a draft implementation plan was prepared, ahead of schedule for internal purposes, the Medical Center developed three proposals requesting external grant funding. Two were submitted to the NLM for federal assistance and one to a private corporation.The NLM proposals were for a Model Development Grant as a Pilot Project to demonstrate the feasibility of launching an IAIMS network at the Medical Center, and the other, a Research Grant for

FIGURE 1

Key IAIMS Planners



Enhancing Interdisciplinary Patient Care by conducting studies designed to identify the most relevant and beneficial features of an IAIMS.

General Strategies of the Ten Year Implementation Plan

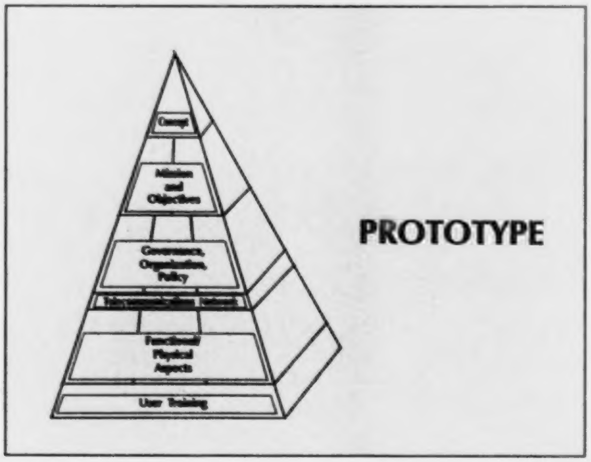
Because of the immensity of the IAIMS project, a multiphasic approach to implementation is planned over a 10 year period. As shown in Figure 2, there were a number of necessary elements that required consideration for development of the IAIMS network. The general strategies of the preliminary implementation plan are as follows:

1. There are three major implementation phases which include:

Pilot (Short Range) Phase	1 to 3 years
Interim Phase	3 to 5 years
Long Range Phase	5 to 10 years

   See Figure 3 for the Georgetown Overall Schedule—IAIMS Implementation.
2. Projects undertaken in IAIMS will be handled on a pilot program basis, i.e. tested, evaluated and modified before being implemented in the Full IAIMS program.
3. Emphasis will be placed, especially in the beginning, on maximizing the potential for success and minimizing risk. Therefore, the approach taken is to begin by integrating and linking Georgetown's most sophisticated systems. In later years more experimental pilots can be undertaken.
4. Medical Center-wide involvement is vital to IAIMS. For purposes of balance, projects with a broad scope may be considered along with those of a specialty and experimental nature.
5. The project will become part of the institution's infrastructure. This is being achieved quite naturally because the Chancellor of the Medical Center is directly involved and supportive of the project, and the channels of communication are facilitated because the Program Manager and the Principal Investigator report directly to him. The newly appointed Vice Chancellor, Dr. John C. Rose, also joined the IAIMS planning effort. All this commitment allows IAIMS to function as an integral part of the Medical Center. Each unit will participate in functional features of the full IAIMS program.

FIGURE 2
IAIMS Network


Concept
Mission and Objectives
Governance, Organization, Policy
Telecommunications Network
Functional/Physical Aspects
User Training
PROTOTYPE

Partnership with University Telecommunications and Information Systems

Strategy to partner with the entire University was emphasized during the planning period. Dr. John C. Rose led a group of thirteen senior Georgetown administrators and educators with representation from the three major centers (Law, Medicine and Main Campus) to attend a two day planning seminar sponsored by AT&T on "Strategic Management of Information Systems" in September, 1984 at Calloway Gardens, Georgia. The team included members of the IAIMS and the Telecommunications Committees. Information gained was extremely useful for the IAIMS project. It also, in part, attributed to the University's interest in changing the campus telecommunications system and in recognizing that for IAIMS to succeed, this change should be accelerated and special requirements of voice, data and image transmission should be part of the new system.

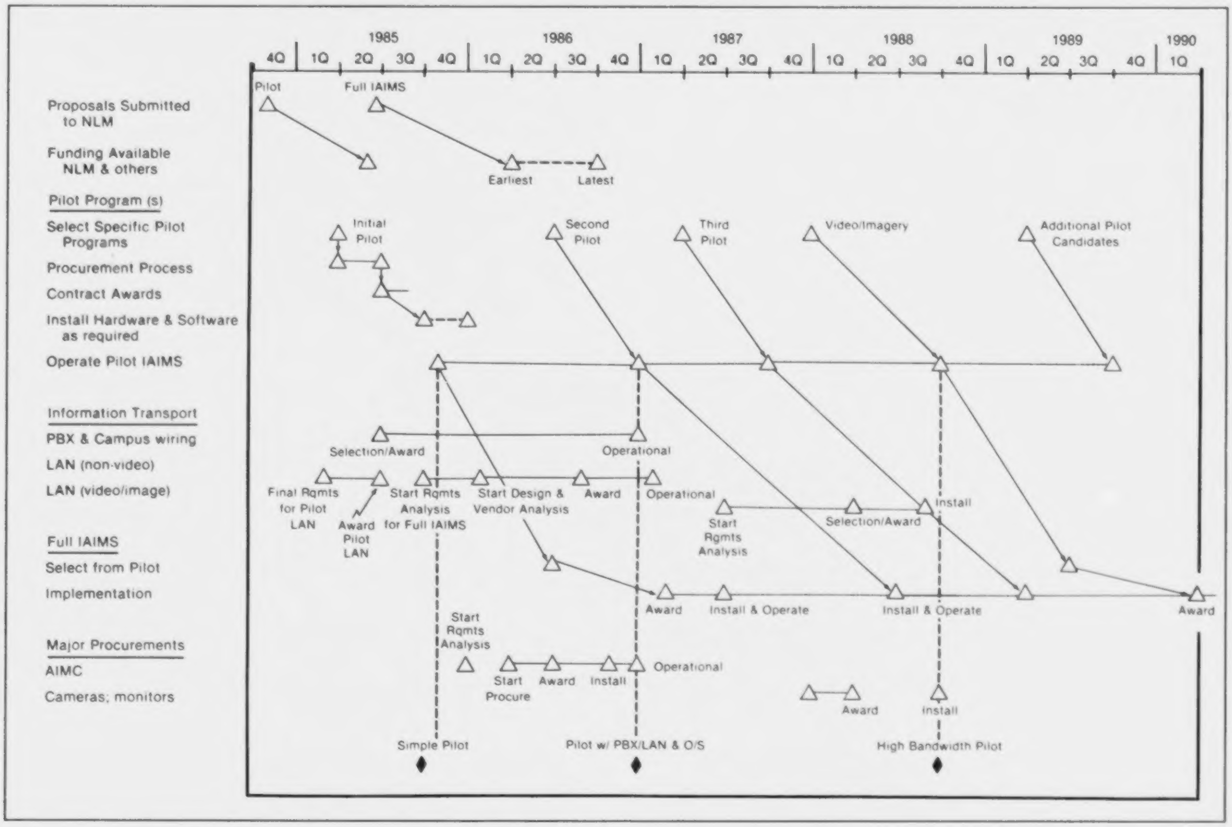
A partnership with the University on overall planning for future information and communications systems has been initiated. While the Medical Center is responsible for the Telecommunications Committee, it also plays a prominent role in a campus-wide Computer Standards Committee which is addressing future needs affecting the entire University. Pertinent aspects of the Medical Center's IAIMS Implementation Plan will be incorporated in the work of this committee.

External Review— The IAIMS Executive Advisory Board

The IAIMS Executive Advisory Board, comprised of nationally recognized leaders in the health, edu-

FIGURE 3

Overall Schedule—IAIMS Implementation



cation and information fields, serves as an external body that provides guidance to GUMC on the planning project. See Appendix C for a list of the Board members. The Board Chairman, Dr. Frank Rose, President of University Associates, conducted three meetings during the project period to discuss and review the work of the IAIMS planning teams. In addition, a technical subcommittee of the Board reviewed the draft implementation plan and the outline for the pilot proposal. Continuous communication and correspondence with Board members is maintained by providing them with copies of all documents and quarterly reports submitted to the NLM. Matthew F. McNulty, Jr., Sc.D., Chancellor of the Medical Center, has met on a regular basis with the board chairman, Dr. Frank Rose. Together they have worked to identify possible corporate support for the project. As a result of initial contacts, AT&T donated some start-up equipment valued at over $100,000 in 1984.

These are a few of the strategic approaches taken which have been merged into the implementation planning document. Further updating and continued refinement will occur throughout the implementation period.

Environmental Forecast Summary (For full text, see Volume III.)

The previous strategic planning work of GUMC associated with its Long Range Plan and a short-term effort during the first phases of IAIMS were the bases for establishment of the key environmental considerations for planning.

In the area of student education, the environment is expected to be one of a flat level of enrollment in the Medical School and slight decreases from the current enrollment levels in the Dental and Nursing Schools. There will also be less government support. The implications of operating the installed plant and ongoing overhead with a decreased enrollment (combined with a lower level of government support) will put a premium on a price performance improvement in the operations associated with the education of students.

Also in the area of education of the medical, dental and nursing student, is the recognized trend towards teaching via problem solving rather than the current didactic method. The implications here will be the demand for student access to a range of diagnostic tools and information sources.

The education of the practitioner will also be a major environmental consideration. With the rate of change in science and technology, there is a greater emphasis on continuing education. The fact that there are 500,000 practitioners in this country versus the 8,000 medical students supports the view that practitioner education must be a major consideration. Also to be considered in this area is the enabling role of IAIMS. The fact that an effective system which will also bring to bear information as effectively, thoroughly, and widespread as that envisioned for IAIMS, will by definition increase the demand associated with the continuing education needs of the practitioner.

The area of health care delivery is characterized by many strong pressures and ongoing trends including:

- The continuing aging population and the fact that there is a higher cost per person for health care treatment.
- The emerging and growing competition and marketing activities among the various hospitals.
- The continued decrease in the availability of public funds to support hospital operations.
- The decreased number of patient admissions and the shorter length of stay resulting from the combined pressure of rising costs and insurance company policies.
- The pressure on price performance in the hospital operations due to the combined existence of competition among the hospitals and the new Diagnostic Related Groups (DRG) policy.
- The positive desire on behalf of health care practitioners to access a broader information base to improve health care delivery as well as the ability to access that information base with the information technology tools and services available.

It is anticipated that current trends related to technology will continue. The trends include decreasing hardware costs with increasing capabilities; software tools that are more "user-friendly" and applications that are easier to implement; increased transmission bandwidth available locally and long distance as well as less expensive high bandwidth transmission capacity on campus; the more pervasive use of digital technology throughout the spectrum of information systems (telecommunications, computers, office systems, etc.) and the fact that many forms of information will therefore be in digital form at some period of their lifetime; and the continued integration of systems and functions across the spectrum of information technology.

The last environmental "forecast" is associated with the utilization of information. Already apparent are numerous dramatic changes in attitudes and behavior in the Medical Center environment related to the management and use of information. Also paralleling the trends in industry in general, information is becoming recognized as a critical resource, and timeliness, form and accuracy are critical to the usefulness of information.

Information Policy Summary
(For full text, see Volume IV.)

Improved utilization of knowledge and management of information will provide the foundation for future progess in the many complex activities of education, patient care and research for the ongoing fulfillment of the Medical Center's mission. Georgetown, like other health care centers, is moving towards an environment of end-user access to institutional data through an IAIMS. The backbone of the IAIMS is an electronic telecommunications network, capable of linking Medical Center users. The complexities of operating and maintaining this communications network necessitates development of an institutional policy that establishes basic principles and operational guidelines for efficient transfer of information throughout the Medical Center.

The Information Policy for the Medical Center, described below, is designed to meet the general operational needs of the IAIMS network at Georgetown. It should be viewed from the perspective that it is based on the current state-of-the-art technologies and disciplines involved, and they will be applied to and utilized by the Georgetown IAIMS. It is recognized that the nature of the environment is extremely dynamic and that its evolutionary character will require that the policy undergo continual assessment and modification to keep pace with the technological, behavorial, organizational and institutional changes that will occur in the future. Seven statements cover a common policy for the Medical

Center and include: Access, Confidentiality, Fees, Ownership, Quality Control, Security and Standardization. Specific departments and divisions within the five major operating units of the Medical Center (Schools of Medicine, Dentistry and Nursing; the Hospital; and the Library) may have internal policies and protocols that must be recognized by users of the IAIMS network. An attempt has been made to follow the University's policies as established in the Faculty Handbook.

The seven key Information Policy positions appropriate to the IAIMS are as follows:

ACCESS	A directory of Medical Center databases will be provided through IAIMS. Databases will be identified and procedures for access will be outlined. Determining the scope of accessibility is the responsibility of the individual units operating and maintaining a database.
CONFIDENTIALITY	It is presumed that most data generated at the Medical Center is privileged and protected by law or policy. Individual units which generate and maintain online systems shall establish and enforce criteria and procedures consistent with applicable laws, regulations and University policy, defining confidential data and determining who is entitled access to confidential information.
FEES	Generally, the policy of the Medical Center is to provide look-up access free of charge within the University community to computer databases maintained internally. There may be charges to users for materials and equipment needed for special services such as reassembling data into unique formats. Costs incurred through access to external computer databases will be passed on to users.
OWNERSHIP	Faculty research, publications, software and inventions are governed by policies stated in the Faculty Handbook. Data and software used for Medical Center administration and operations will be controlled by the department or unit responsible for their development and maintenance.
QUALITY CONTROL	Units providing data in the IAIMS network will establish procedures to ensure accuracy and currency of records. National standards for quality control will be followed wherever possible.
SECURITY	Units participating in the IAIMS network are responsible for establishing procedures to: —Prevent inaccurate data entry, unwarranted deletions and unauthorized use or theft; —Protect software and hardware from physical damage and theft; —Provide adequate backup systems for automated operations wherever possible. Common elements of the IAIMS network will be protected by the IAIMS Program Manager who will be responsible for operating the system. Sanctions for violations at the intra-institutional level are to be developed by the individual units.
STANDARDIZATION	To facilitate electronic communication among participants in the IAIMS network, the IAIMS Program Manager, in conjunction with representatives of the Medical Center units, may define a variety of standards for hardware interface and software development.

Self Study Inventory and Analysis (For full text, see Volume IV.)

An essential part of the strategic planning process involved a realistic examination of the technological resources and degree of automation in existence at Georgetown. A self study inventory was undertaken to identify current resources and match them to future academic information management goals of the Medical Center. Data for the self study, collected from a brief questionnaire and personal interviews of 49 departments/divisions, has been compiled into an online database with an established mechanism for quarterly updates.

Inventory: A general summary of the Medical Center's hardware inventory revealed the following characteristics. The Medical Center has over 1,400 various equipment items consisting of microcomputers, word processors, minicomputers, a mainframe and related peripherals. To-date, cumulated hardware/software costs total approximately $6M to $7M. The minicomputers are largely DEC or Data General; the microcomputers are IBM or Apple and the modems operate primarily at 300 or 1200 baud. The Hospital and the Library operate the general use computers; the others are departmental machines for diagnosis or special research studies. External computer services are used to handle special work such as the faculty practice plan, poison information and the dental clinic data. Information flow pattern indicates significant external information accessed by Georgetown from vendors and services but only moderate flow from Georgetown to other institutions. For details, see table at right.

Analysis: The assessment of technological capabilities of Georgetown, derived from the self study inventory yielded the following analysis:

1. Technologies of Medical Center Libraries: The Dahlgren Library is the primary Medical Center Library. There are also 27 small departmental libraries within the Medical Center. Of the three major campus libraries, the Dahlgren Library is the only one which is fully automated. Approximately 17 Medical Center departments access the Library Information System (LIS), generally through dial-up mode. Three computer stations, located in the Lombardi Cancer Center, the Department of Medicine's Jeghers Room and the School of Nursing faculty laboratory are directly connected through leased lines to the LIS.

2. Uses and Networking of Computers in Research Laboratories and Offices: Computer use in research laboratories falls into broad catagories of equipment and materials inventories; data storage, organization and retrieval; budgeting; and tracking of experimental protocols. The Pharmacology Department has programmed several microcomputers to

Summary of Computer and Information Flow Inventory

1. Equipment Summary

Respondent Departments/Divisions 49

Equipment	Quantity	# Departments
Word processors	51	19
Microcomputers	163	34
Minicomputers	35	14
Mainframes	1	1
Terminals	634	37
Printers	332	38
Modems	91	27
Video monitors	42	13
Barcode readers	29	3
Additional equip.	53	13
TOTAL	1,431	

2. Cost Summary

Hardware and Software Investment Range .... $6-$7 million

3. Hardware Characteristics

Mainframe .... IBM 4381

Microcomputers	Minicomputers	Modems
IBM 61%	DEC 37%	90% operate at 300 and 1200 bps; 8 of 91 operate faster than 1200.
Apple 24%	Data Gen. ...26%	
Others 15%	Others 37%	

4. Computer Distribution

Hospital/HIS	7	(Data General, IBM)
Cardiology	4	(2 each PDP 11/34, 11/23)
Radiology	5	(PDP 11/34, 11/44; Philips; VAX 11/730; Data General)
Radiation Medicine	2	(PDP 11/44; EMI)
Dahlgren Library/LIS	3	(PDP 11/44, 11/34; VAX 785)

5. Use of Remote Processing Centers/Direct Lines

Medical School—Controller/Dean's Office
SDC (California)

Poison Control—Hospital
Micromedics (Colorado)

Dental School—Clinic
Data Day (Florida)

6. Current Information Flow Characteristics

35 Departments access mainframes (CCF, SDC, etc)
27 Departments access minicomputers (LIS, HIS, etc)
Significant external flow to sites outside Georgetown: (SDC, NLM, NIH, NBRF, etc)
Moderate flow from institutions to Medical Center:
Poison Center
20+ libraries access LIS
External flow via public switched network at low speed (300 or 1200 bps): leased lines to SDC

drive laboratory experiments without human intervention. The Lombardi Cancer Center and the Division of Cardiology each maintain clinical research databases for tracking patient data through protocols and clinical trials. Computers in offices are used predominantly for word processing, financial planning and patient billing. Internally, the basis for a Medical Center-wide network has already been established. Over 264 terminals are linked to the Hospital Information System (HIS), 65 terminals access the Faculty Practice Plan directly, and the Library has over 60 terminals with direct access to its computer and remote access through four dial-up ports.

3. Uses and Networking of Computers for Manuscript Preparation: Data contained in the self study inventory indicates that there are 51 word processors in 19 departments of the Medical Center. Each of these machines is dedicated to such tasks as text editing, bibliography compilation and manuscript preparation. In addition to these single purpose machines, there are 163 microcomputers housed in 34 departments with variable uses including word processing.

4. Use of Computers for Inter- and Intra-Institutional Information Exchange: Although most networking for information exchange is internal within the Medical Center units, some information exchange occurs between the Main Campus, the Medical Center and off campus computers. Currently there are 7 on-campus computer systems and 24 additional external computer systems accessed by the Medical Center departments. There are several unique inter-institutional arrangements on the Medical Center campus. Hospitals affiliated with Georgetown use the LIS to borrow materials from the Dahlgren Library through the Interlibrary Loan network. Both the Hospital Information System and the Faculty Practice Plan use electronic tapes to transfer patient data to Blue Cross/Blue Shield.

5. Availability of Human Skills for Academic Information Problem Solving: The pool of individuals with skills for academic problem-solving at Georgetown is large. Over 12 departments utilize 30 internal staff members for programming. Key individuals nationally known for their accomplishments in the field of computers and automation are Robert S. Ledley, DDS; Louis S. Rotolo, MEA; William R. Ayers, MD; Alan E. Zuckerman, MD; Donald Segal, MS; Walter Bechtold, DDS; and Naomi C. Broering, MLS,MA.

Needs Assessment Summary

The Self Study was designed to identify existing computer resources on the Medical Center campus, to determine how these resources could be utilized in an IAIMS network to meet functional and management goals of the Medical Center, and to chart the flow of information between functional units. For detailed illustrations see IMPLEMENTATION PHASES OF IAIMS, the section on Pilot Phase: Figures 19-22. Present computer and communications systems were inventoried and, in addition, every department/division interviewed in the self study was asked to review its future automation goals. These goals generally fell into two broad catagories: internal and external. The internal goals tend to be department-specific. For example, Anesthesia and Radiation Control need automated files for their respective inventories and use of these files would be primarily intra-departmental. External goals are more general and often have wide applicability throughout the Medical Center. Several departments expressed interest in a computerized reservation system for lecture space and in Local Area Networks (LAN) for improved campus communications. External goals also generally involve sharing of resources across departments and divisions.

Most departments and divisions interviewed had similar priorities for internal goals, ranked in the following order:

- automation of internal functions, beginning with word processing;
- creation of automated departmental files or, alternatively, expansion of existing automated files;
- development of electronic links to external departments and databases.

In addition to the self study inventory data, several brainstorming sessions conducted at the planning retreats included scenarios of how information access could be improved, utilized, delivered and shared. The ground rules for these discussions encouraged planners and users to think primarily of information needed. A number of use scenarios were developed applicable to the IAIMS architecture.

Information Use Scenarios

1. Dealing with the medically compromised patient in the dental clinic.

SOLUTION: a. Online access to medical history
b. Consultations with medical colleagues through electronic communication

c. Current articles on patient management via online bibliographic or full-text databases

2. Coordinating medical students and residents working at eleven affiliated hospitals in the metropolitan DC area

SOLUTION: a. Teleconferencing for educational programs

b. Remote consultations with specialists at Georgetown through electronic means

3. Signing off on medical records from a remote site by a clinical practitioner.

SOLUTION: a. Online access to patient records to review tests ordered by resident

b. Ability to order additional tests, if needed

c. Review patient management and complete the medical record

System Functional Requirements

1. Hardware and Software Needs: Establishment of an electronic office is a top priority in many departments throughout the Medical Center. Departments and divisions, such as Cardiology and Radiology, which use computerized tools for patient care, already tend to have highly automated offices. Departments in the Dental School appear to be the least automated and do not yet have a strong framework for networking such as that provided by the Hospital Information System and the Faculty Practice Plan for the hospital and clinical medical faculty.

There is widespread interest across the Medical Center for certain types of databases. Nearly every department/division believes that current clinical and experimental databases are inadequate. Much work needs to be done in automating complete patient records, integrating inpatient and outpatient files, providing patient demographic data, and creating computer files for protocols and clinical trials. Medical Center researchers need a powerful statistical program with graphic capabilities to manipulate and analyze experimental data.

2. User Access: During the self study interviews, all departments expressed interest in having access to the Library Information System's Online Catalog and miniMEDLINE SYSTEM. Many want online access to external systems, such as AMA/GTE, and to University records. These include records maintained by Accounting, the Registrar's Office, the Financial Aid Office, Sponsored Programs, and the Central Computer Facility (CCF). Only three offices—the Chancellor's, the Controller's and the Librarian's currently have online access to the CCF. Yet student grades, test scores, financial data, and personnel records for much of the Medical Center are maintained at the CCF. Several departments, including Pediatrics and Community and Family Medicine, have mounted special databases on the CCF which generally must be searched offline. The widespread interest in online access clearly indicates the need for increased linkages through knowledge gateways, local area networks and a campus-wide telecommunications system.

3. Educational and Training Resources: Departments/divisions involved in teaching expressed interest in an additional set of files such as computer-assisted instruction, knowledge databases, student demographics, online syllabi and continuing education programs. Additional suggestions regarding automation and communications at the Medical Center included an online directory of Medical Center computer and software resources, and the creation of a position for an in-house information resources expert.

Both consulting and the sharing of expertise will play an important role in meeting the internal needs of each Medical Center department/division. Many departments/divisions do not currently know how to automate files, while other departments/divisions are duplicating the already successful efforts of colleagues.

In summary, the functional management goals of the Medical Center will be more readily met through improved interdepartmental communications, increased access to a variety of University records, and the development of general databases for administrative support. These are outlined below:

Patient Care/Research Needs

Automated patient records
Automated pharmacy
Clinical databases
Computerized billing (for departments not on Faculty Practice Plan or HIS)
Drug interactions online
Electronic access to Blue Cross/Blue Shield
Expanded tumor registry
Experimental databases
Funding sources online
Patient demographics

Statistical package with graphics capabilities
Direct access needed to:
  Accounting
  Central Computer Facility (CCF)
  Dahlgren Memorial Library
  Outside bibliographic utilities
  Purchasing
  Sponsored Programs

Education: Student/Teaching Needs

Computer-assisted instruction
Computer reservation system for lecture space, other facilities
Continuing Education Programs online
Knowledge databases
Syllabi online (to avoid duplication of course content)
Access needed to:
  Biographic data on faculty and clinical staff
  Financial Aid Office
  Registrar's Office
  Student demographics
  Test scores in CCF

IAIMS Implementation Plan

Ten Year Goals and Stages of Development

The Association of American Medical Colleges report (1982) stated that "the challenge before the biomedical community is to augment the power of the human mind to use knowledge." (1) This is the rationale for the programs that will comprise IAIMS at Georgetown. The mission, goals and objectives of GUMC, as in other Medical Centers, are consistent and related to IAIMS in that continued academic excellence in teaching, patient care and research are of utmost importance. While the scholarly academic setting provides new knowledge to refresh and update the health care system on a daily basis, the use of this knowledge is unsystematic, and the ability to transmit information in an accelerated manner to practitioners is highly unorganized.

During the process of implementing IAIMS over a ten year period, the Medical Center will move through three stages of Technological Development.

Stage 1	Substitution—Transfer from paper-based system
Stage 2	Innovation—New services previously unavailable
Stage 3	Transformation—Change ways of handling information

Of the three stages of Technological Development, IAIMS is currently in Stage 1 (Substitution). Through IAIMS the Medical Center is attempting to harness information so it can be managed more effectively. To reach this stage, transfer from paper-based systems to computer-based systems must be achieved.

In order to move to Stage 2 (Innovation), the ability to provide new information services previously unavailable, a major educational and training effort is planned. Users will be given opportunities to begin to think as information seekers and to apply new technology. Once they become comfortable thinking in this mode, new innovative approaches and ideas can emerge.

To achieve Stage 3 (Transformation), a total change in the way information is handled, there must be an unconscious awareness and emergence of new knowledge. When this occurs the Medical Center will have created a new medium for the pursuit of intellectual excellence. The methods and means of using information will change beyond our present imagination. (2)

Acting on challenges to keep up with the exploding knowledge base, to teach state-of-the-art medicine, and to utilize advanced technologies to manage biomedical information, GUMC established two major goals to make information more accessible. The first involves Academic Information Management. The second pertains to the University's pursuit of excellence in developing an IAIMS prototype. Georgetown intends to develop an environment where the most efficient teaching and learning methods available today are adopted and where the latest techniques in managing information for research and patient care are utilized. In assuming a leadership role in IAIMS development, the Medical Center plans to excel and become a national resource.

THE FIRST GOAL

ACADEMIC INFORMATION MANAGEMENT **To Improve the Transfer of Biomedical Information and Utilization of Recorded Knowledge in Support of the Medical Center's Programs by Developing an Integrated Academic Information Management System.**

OBJECTIVES

To achieve this goal four objectives address the ability to integrate operational and academic information sources into useful conjunction and to maximize the utilization of the range of information technology systems and services including telecommunications, computers, image transmissions and office systems. IAIMS will include access to internal and external databases.

1. EDUCATION **To Support Changes Taking Place in the Concept and Methodologies of Health Professions Education and Clinical Care, Primarily the Movement Away From Paper and Memorization to Independent Learning and Development of Problem Solving Skills in Patient Care.**

This includes developing programs to conduct the following:

- Integrate educational databases by designing information programs for students using a relational database approach.
- Evaluate and implement opportunities to improve education through computer based information programs for teaching and learning activities.
- Integrate the use of computers in the educational programs of the health professional schools utilizing mechanisms of logical access.
- Experiment with approaches to medical decision science to enhance problem solving skills.
- Develop a communications network system that provides unified access to internal computer systems, especially the Library and the Hospital, and to external systems.
- Provide an information network for Continuing Education programs to support the life long learning needs of health professionals.
- Establish an Academic Information Management Center (AIMC) of core support services in the Library for use by students and faculty.
- Develop a computer laboratory in the AIMC for education and research in Medical Informatics including use and design of expert systems, diagnostic systems, knowledge bases and bibliographic databases.
- Encourage and support individuals and departments in improved management of information through use of personal information systems and database management systems.
- Train users at the AIMC in information access skills and how to utilize the IAIMS network, internally and externally.

2. RESEARCH **To Sustain and Improve the Clinical and Basic Sciences Research Effort at the Medical Center Essential to Educational Excellence and Enrichment of the Academic Environment by Using Advanced Information Management Technologies to Enhance Scholarly Research Studies.**

This includes launching programs to provide the following:

- Use expanding technologies and integrated systems to develop and enhance existing and new research databases.

- Implement a multiphasic program to provide clinical and basic science researchers with automated mechanisms for maintaining their records.
- Reduce redundancy in institutional databases by sharing core information through an integrated system with unified access.
- Provide institutional database management systems using a "programmerless" approach to enable researchers to develop and manipulate data in their personal files.
- Provide rapid access to internal and external informational databases through an electronic network system for researchers conducting clinical and basic sciences investigations.
- Advance knowledge and disseminate research results quickly to practitioners to provide improved patient care.

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3. PATIENT CARE To Maintain the Highest Standard of Clinical Services by Enhancing and Further Developing the Hospital Information System (HIS) to Provide Clinical Practitioners with a Full Range of Information for Patient Care.

This objective includes the following activities:

- Provide physicians and health professionals with electronically transmitted diagnostic information on their patients including:
  a) X-ray results
  b) Clinical Laboratory reports
- Implement a program to automate the clinical departments in sequential steps.
- Reduce redundancy in data entry by developing HIS so patient records can be electronically transferred when interdisciplinary care and referrals are recommended.
- Refine and enhance the HIS patient management capabilities at the nursing workstations and the patient bedside.
- Implement a 'natural language' approach for storing and retrieving patient data.
- Continue to enhance the admissions and billing systems to meet patient needs and to comply with federal reporting regulations on diagnostic related groups.
- Evaluate the potential for electronic transmission of prescriptions by physicians to the Hospital Pharmacy.
- Provide attending physicians in the community with access to information on their patients from their homes and offices.
- Provide electronic admissions capabilities to community physicians from remote sites.
- Explore implementation of a unified medical language as advances are achieved in this field.

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4. MANAGEMENT To Develop an Information System that Incorporates Technological Advances, Decision Support Systems and Office Automation to Enhance the Strategic Position of the Medical Center's Programs.

This includes activities in the following areas:

- Establish a system for maintaining databases appropriate to administrative functions.
- Utilize these databases for long range and financial planning.
- Provide office automation tools including electronic mail, calendar, bulletin board and electronic filing.
- Establish connections to the Main Campus accounting systems to accelerate business functions and record maintenance.

- Provide online mechanisms for the schools to electronically manage admissions and enrollment of students.
- Project varying scenarios on tuition, enrollment, financial aid for budget preparation and management decisions.
- Maintain an improved database on sponsored program grants of the Medical Center.
- Connect the Chancellor's Office electronically with the offices of the Deans, the Hospital Administrator, the Medical Director and the Medical Center Librarian for transmission of management information.

THE SECOND GOAL

EXCELLENCE

To Become a "Center of Excellence," a Prototype IAIMS, to serve as a National Resource for Other Academic Health Science Centers and Other Health Related Organizations; To Engage in Research and Demonstrations on Use of Advanced Technologies in the Health Field.

OBJECTIVES

Recognizing that Georgetown is pioneering in a highly evolutionary process rapidly emerging in this Information Age, the Medical Center believes that it is responsible for disseminating information about its progress in implementing IAIMS. The Medical Center plans to establish the best possible IAIMS prototype and intends to maintain the highest quality programs in pursuit of excellence. The outcomes of the four major objectives in this goal are intended to be beneficial to the nation's other medical centers as well. They include:

1. SHARE INFORMATION ON APPLICATIONS PROGRAMS

To Promote the Availability and Share Information Resources of the IAIMS Applications Programs Developed and Utilized by the Medical Center with the Health Sciences Community and Other Academic Medical Centers.

This objective includes developing vigorous programs to:

- Evaluate and test software so that information can be provided to others.
- Organize a program of information exchange activities at the Medical Center in which faculty and students can participate such as Information Fairs, Microcomputer Day, User Group Meetings, Seminars and Symposia on Information Management.
- Develop publicity materials highlighting accomplishments of IAIMS and special applications software or databases that are outcomes of IAIMS sponsored projects.
- Disseminate information on IAIMS throughout the public and private sector. (See Appendix G. for list of Institutions that have received IAIMS Planning information from Georgetown).

2. MEDICAL INFORMATICS

To Contribute to the Accomplishments of Medical Informatics by Designing and Utilizing New Approaches in the Use of Computers for Improved Medical Decisions, Clinical Diagnosis and Information Management.

Activities in this objective include the following:

- Encourage faculty in design of knowledge gateways and interface software that facilitates use of computers in the biomedical sciences.

- Design database management system software that accepts "natural language" and is user cordial.
- Emerge as a center that explores the use of artificial intelligence and expert systems.
- Offer the resources of the Medical Center to research laboratories and private industry interested in working with Georgetown to test concepts and special products.
- Work cooperatively with the NLM and other federal agencies to design and develop special knowledge databases and artificial intelligence systems to advance the transfer of biomedical information.

3. CONFERENCES ON IAIMS

To Contribute to the Nation's Knowledge Base About Development of IAIMS at Health Sciences Institutions by Sponsoring and Participating in Scholarly Conferences on IAIMS.

- Sponsor conferences on IAIMS to exchange information.
- Invite Georgetown and non-Georgetown faculty, researchers and students to present papers on projects in medical informatics including artificial intelligence, expert systems, clinical simulation programs, computer-assisted instruction, knowledge databases, bibliographic databases and information systems.
- Provide an environment for presentations on applications of new technologies to IAIMS such as laser disks, compact disks, fiber optics based telecommunications systems, digital and analog image transmission, advanced communications systems and fourth and fifth generation computer systems.
- Publish proceedings of the conferences on IAIMS and encourage publication of scholarly articles on achievements of IAIMS projects.
- Present papers on IAIMS planning, development and implementation at national association and professional meetings.

4. CONSORTIAL ACTIVITIES

To Engage in Consortial Arrangements for Resource Sharing with Other Developing IAIMS Prototypes to Achieve Economy of Scale in Transfer of Information and Utilization of Knowledge.

This objective involves developing cooperative activities to conduct the following:

- Expand an emerging IAIMS consortium to include other institutions engaged in implementation projects.
- Organize sharing programs among IAIMS institutions on artificial intelligence, expert systems and information management systems.
- Participate in consortial projects to develop biomedical dictionaries, natural language systems and approaches to design of a unified medical language.
- Share Georgetown developed systems and databases with other participating consortium members.

IAIMS Implementation: Organization

To develop and implement an effective information management system is an immense challenge in today's environment of continuous technological changes. The nature of an integrated network and information environment means that technical or policy decisions made by departments and by the University can inevitably impact the entire IAIMS program of the Medical Center. To be successful, IAIMS not only needs adequate financial and human resources, but strong political clout within the campus. Therefore, IAIMS requires top-level administrative support and leadership from the Executive Officer, the Chancellor of the Medical Center, who is in the mainstream of the University's information chain.

Continued interest of the Medical Center's top officials is essential, especially during the early pioneering stages of implementation when organizational changes and expansion are taking place that may alter existing arrangements. The forces of the Medical Center need to be cohesively mobilized so there is a clear understanding of the benefits to be derived from improved transfer of biomedical information.

Fortunately, the organizational structure of the Medical Center lends itself to a smooth transition for management of IAIMS. Since the early planning stages of 1983, IAIMS has been part of the Medical Center infrastructure. The Chancellor of the Medical Center appointed a Development Team to develop the IAIMS plans. Membership of this Team included individuals from each unit of the Medical Center and a senior academic staff member of the Chancellor's Office. This Team reports to the Chancellor on a regular basis at meetings of the Administrative Council and the Medical Center Council which he chairs. The Council members include the Deans of the Schools of Medicine, Dentistry and Nursing, the Medical Director, Hospital Administrator, and Medical Center Librarian as well as Faculty Senate members. Consequently, top management of the Medical Center is actively involved in the planning of IAIMS and the pilot and research projects.

The organizational structure proposed for Implementation of IAIMS is consistent with the established pattern and management traditions of the Medical Center. It represents a natural progression of on-going planning work accomplished since 1983 by the IAIMS Development Team. Because most of the IAIMS planning has been conducted by the groups who will provide future managerial leadership of IAIMS, and because top level administration is involved in the planning, IAIMS has become a team effort in which the Medical Center units each have a stake in its success. The Medical Center does not require major organizational changes to implement IAIMS. In fact, a logical and sequential managerial hierarchy is planned that allows input from all participants and follows the academic and scholarly traditions of the Medical Center with representation from varying levels regardless of an individual's station. Faculty, staff and students will be given an opportunity to serve on IAIMS advisory committees. The leadership and organizational plan is as follows:

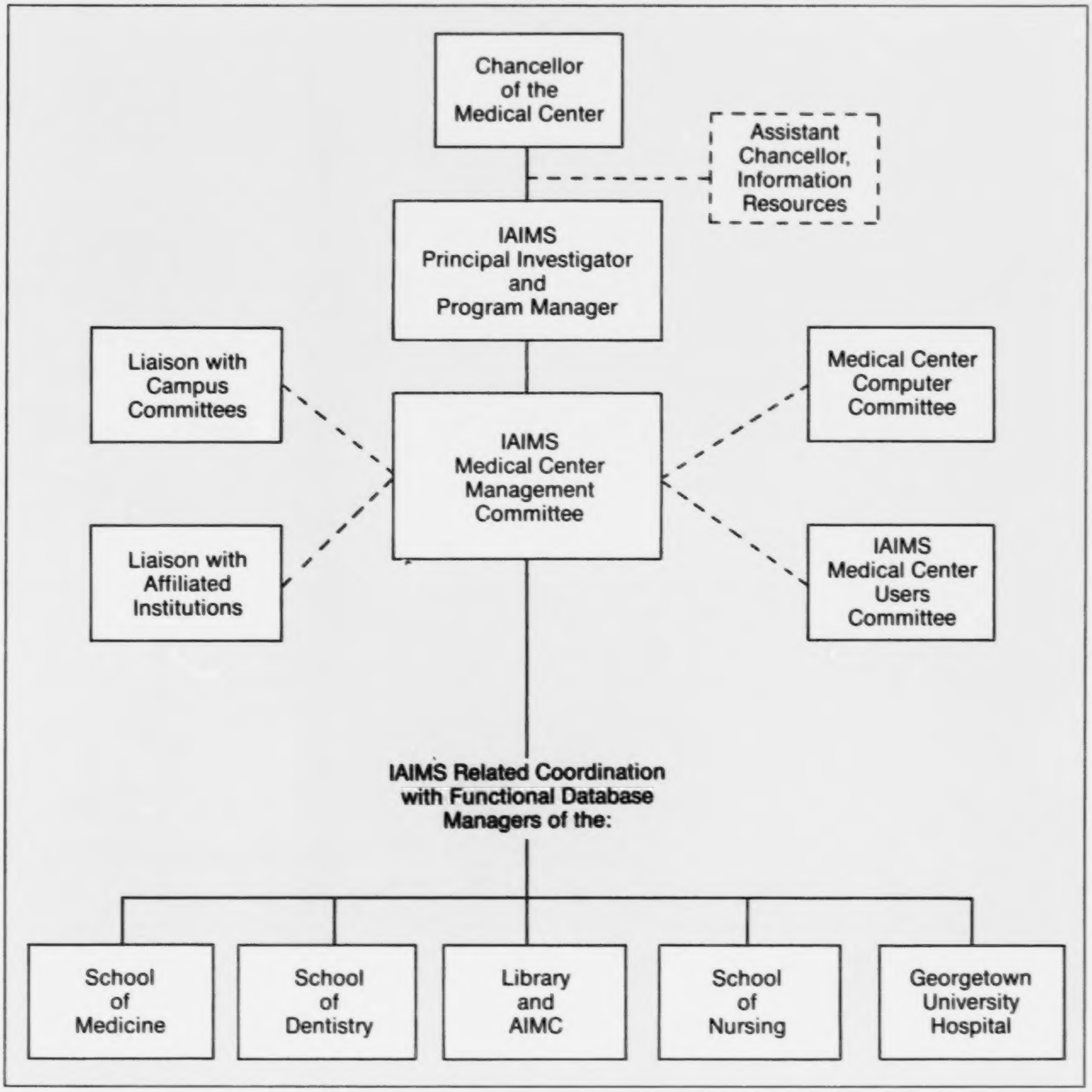
IAIMS Leadership and Organization Plan (See Chart, Figure 4)

CHANCELLOR OF THE MEDICAL CENTER	The Chancellor of the Medical Center is responsible for administration of information and communications resources. Staff responsibility within his office is delegated to two individuals: one for telecommunications and another for information (IAIMS).
IAIMS PROGRAM MANAGER	The existing Program Manager for IAIMS reporting to the Chancellor will assume additional responsibilities for assuring smooth implementation and operations of the IAIMS projects. This person will coordinate functional management issues as they relate to IAIMS among the database managers throughout the Medical Center.

ASSISTANT CHANCELLOR FOR INFORMATION RESOURCES	It is in the long range plan that as soon as resources can be identified, a position will be established at the Assistant Chancellor level to develop and manage information resources for the Medical Center. This person will coordinate telecommunications and computer information systems as well as serve as liaison to the IAIMS program for the Medical Center. This individual would probably chair the University Telecommunications Committee and the Medical Center Computer Committee and be a member of the IAIMS Management Committee.
IAIMS MEDICAL CENTER MANAGEMENT COMMITTEE	To coordinate the IAIMS activities a committee with equal representation from the five Medical Center units (Schools of Medicine, Dentistry and Nursing, the Hospital and the Library) will be established. Members will be key individuals involved in management of information resources who serve as functional database managers for their units. Because IAIMS is a Medical Center-wide resource, and because a distributed system approach has been selected by Georgetown, it requires management by a cooperative committee that communicates regularly and is willing to assure success of the system. The IAIMS Manager will serve on this committee and the Chairman will be appointed by the Chancellor.
LIAISON WITH THE UNIVERSITY AND AFFILIATES	Liaison with the University-Main Campus, the Law Center and the affiliated institutions will be provided by dual appointments on appropriate committees (such as the Telecommunications Committee) as they are established and by providing special ex officio status to individuals who by nature of their positions should participate in the meetings of the IAIMS Committees. This is especially vital during the implementation of the Telecommuncations System and now that the University has established a committee on Standards for Computer purchases.
MEDICAL CENTER COMPUTER COMMITTEE	This committee will serve in an advisory capacity to the IAIMS Committee. Items of IAIMS policy involving security, standards and confidentiality of informational databases and access to the network system will be coordinated through this computer committee. During the planning stage of the IAIMS Information Policy, this committee has served as a review body. Similar needs to review documents are envisioned in the future.
IAIMS USERS COMMITTEE	To assure that faculty, staff and students are provided with adequate IAIMS services, a User Committee, similar to the Library Committee, will be established to serve as an advisory group to the IAIMS functional management. Membership will be appointed by the Chancellor and meetings will take place on a monthly basis. This group will participate in recommending future pilot projects for IAIMS and submitting suggestions for final selection to the IAIMS Committee.

FIGURE 4

IAIMS Organization Chart


Chancellor of the Medical Center
Assistant Chancellor, Information Resources
IAIMS Principal Investigator and Program Manager
Liaison with Campus Committees
Medical Center Computer Committee
IAIMS Medical Center Management Committee
Liaison with Affiliated Institutions
IAIMS Medical Center Users Committee
IAIMS Related Coordination with Functional Database Managers of the:
School of Medicine
School of Dentistry
Library and AIMC
School of Nursing
Georgetown University Hospital

Position Description Assistant Chancellor for Information Resources*

Purpose:

The Assistant Chancellor for Information Resources is a senior management position with staff responsibility for strategic planning, promotion and coordination in the field of information resources, including both administrative and academic computing, telecommunications, video and related technologies.

The position exists to increase Medical Center knowledge of the scope, applications and potential impacts of advanced information systems and information technology; to enhance coordination and resource sharing and to lead planning and evaluation of the use of information and related technology; to manage and control various centrally provided information services; to develop and monitor policies and approaches to hardware and applications; and to foster, guide and support decentralized yet linked information resource initiatives.

Detailed Responsibilities:

- To provide leadership and guidance to schools, central services, hospital and individual faculty and staff in the selection, development, application and distribution of information resources.
- To lead the planning and to coordinate and support the development of distributed information resources.
- To lead the planning and to coordinate the networking of the telecommunication systems of the Medical Center, including all data and voice transmission, broad-band cable, cable TV, microwave, etc.
- To recommend and administer policies and procedures for the management of information resources.
- To represent the Medical Center campus in information resource activities of the University and at various review and planning agencies.
- To obtain extramural funds to support IAIMS and other related Medical Center-wide projects.

Qualifications:

Minimum Requirements—Baccalaureate degree; a working knowledge of information science, of the management of information including networking, interactive computing and fourth generation computing concepts and of telecommunications concepts and systems; superior knowledge of group dynamics and behavorial patterns of professional and scientific personnel.

Preferred Background and Characteristics—Graduate degree in any of the information fields or the sciences with information management experience and skills. Knowledge or experience in academic settings including some scientific research and health sciences experience. Demonstrated ability to achieve results from a complex organization through staff functions and highly developed interpersonal skills, leadership and personal prestige. Strong orientations to distributed processing and office automation blending micro and central computing and to integrated information via networks and relational databases. Concept-selling skills. Forward-looking orientation. Strong management and group process skills, especially related to professionals and technical staff. Experience in fund raising and grant activities. Excellent oral and written presentation skills.

Implementing IAIMS at the Medical Center Units: Functional Plans

The distributed system approach adapted by GUMC preserves the current databases and data processing systems of each unit. The IAIMS services will supplement these systems through integration and interface of major resources and through a network of micro to micro and micro to mainframe communications systems for Medical Center-wide access. In this manner IAIMS will accelerate the flow of information throughout the key units of the Medical Center and the distributed systems approach will serve to elevate the capabilities of each unit (see Figure 5).

School of Medicine
School of Dentistry
School of Nursing
University Hospital
Library and Academic Information Management Center
Office of the Chancellor of the Medical Center

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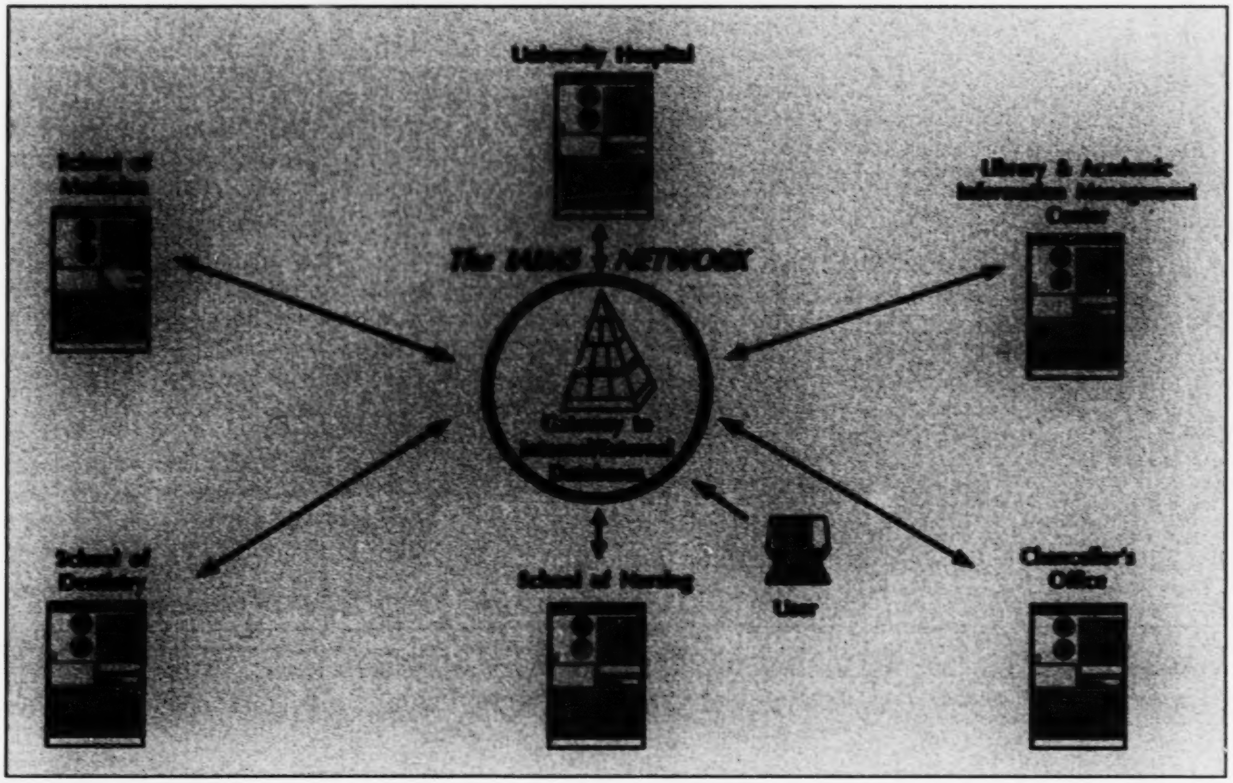
*This position description has been adopted from the University of Maryland's which was provided to Georgetown by Dr. George Stuehler, Vice Chancellor of Administration.

FIGURE 5

Flow of Information Through IAIMS at the Medical Center



Each unit maintains its own functional computer and information system and each unit has developed plans that are directly or indirectly related to IAIMS. Highlighted below is a brief summary outlining the information management goals of the units and the Office of the Chancellor.

Functional Goals of the School of Medicine

Present Computer Systems

Many pieces of computer hardware and software are used daily in the Medical School for administration, teaching and research. Recent surveys conducted by the Medical Center Committee on Computers and the Medical School Committee on Computers in Education indicate both a change in hardware/software configuration and attitudes toward computer usage by the faculty. Dr. Harold Schoolman of the National Library of Medicine spent the 1981-82 academic year at the Georgetown University School of Medicine on a special intergovernmental exchange. He undertook a research study with the Dean to determine the awareness and readiness of faculty to participate in the imminent revolutionary use of computers facing health sciences centers. These initial surveys served as a useful baseline for planning.

The School of Medicine also has an online management system for its Faculty Practice Plan, accessed through an online service bureau in California. Data integrity is guaranteed by the service. The system is used primarily to bill for physician services and diagnosis, but is also used for personal research by physicians. The services and fiscal data are registered into the system, and each department draws up-to-date information.

Plans for Future Development

Major information management concerns in the School of Medicine focus on support of the educational, research and patient care programs. Steps will be taken to advance biomedical information transfer to meet the needs of the School. Support of the IAIMS Program and formation of a Medical Informatics office to advise faculty on computer issues and problems are included in the School's long range plan. It is also evident that future students will come to the School of Medicine with definite but differing levels of computer literacy which will be addressed. The School's objectives and proposed activities are listed below:

OBJECTIVES

EDUCATION **RESEARCH** **PATIENT CARE** **MANAGEMENT**	**To utilize advanced technologies to improve the programs of the School of Medicine by developing appropriate databases, acquiring software applications programs and enhancing the information management, access and problem solving skills of faculty, students and staff.**

This includes plans to:

- modify curriculum and extend existing computer learning to accommodate the increasingly sophisticated student body. It has been decided by the Committee on Computers in Education that the application of basic science skills be incorporated in the decision-making process covered in the Introduction to Clinical Sciences course of the second year.
- continue to encourage faculty to work with students on electives and in individual faculty office settings to develop clinical simulation models for the above-cited curricular changes.
- require a beginning level of computer literacy for incoming classes. During the interim, students accepted but not yet computer literate will have remedial courses in computer usage.
- continue to provide instructional classes in the use of personal computers through the Medical Center Library.
- continue development and refinement of the Personal Information Management for Medical Students (PIMMS) system for data entry of notes and references.
- design knowledge systems and databases to supplement classroom learning.
- enhance interaction among the management systems now supporting the Faculty Practice Plan, Clinical Database and the University accounting system.
- sponsor Continuing Medical Education courses on use of personal computers by practicing physicians in the attainment of improved patient management skills.

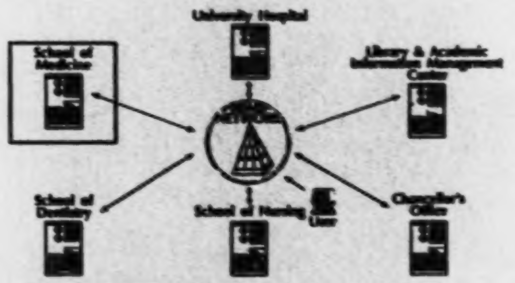
As part of the general support for these activities the School of Medicine, working with the IAIMS program, plans to acquire or develop decision support systems for use by staff engaged in teaching, patient care, research and management. Some of the basic databases and systems are shown in Figure 6.

EDUCATIONAL PLANS:

The School of Medicine Computer Committee drafted a set of recommendations on computers in medical education with the intent of providing exposure and opportunities for Georgetown clinicians at the undergraduate, graduate and postgraduate levels. In line with the primary educational and research mission of the School, the report emphasizes and concentrates on providing computer assisted instruction, establishing research and clinical databases, but primarily on developing graduates who are computer literate. Relevant factors, of course, are faculty development opportunities to attain computer knowledge. Summarized below are some of the recommendations:

1. Develop a definition of computer literacy for all levels of students.
2. Provide a required course in medical computing to be implemented as a lecture series in the Introduction to Clinical Sciences curriculum.
3. Encourage medical school applicants to take college-level computer courses, as an admission requirement to Georgetown.
4. Develop a computer network for intrainstitutional and interinstitutional information exchange.
5. Encourage the use and acquisition of personal computers by faculty and students.
6. Engage in database development: computer-assisted instructional programs; clinical databases; knowledge databases.
7. Utilize intrainstitutional databases for educational purposes.

FIGURE 6
The School of Medicine



- **Education**
  - **—Clinical Simulations**
  - **—Continuing Education System**
  - **—Medical Computing**
  - **—Personal Information Management**
- **Patient Care**
  - **—Clinical Databases**
  - **——Diagnostic Imaging**
  - **—Expert Systems**
- **Research**
  - **—Basic Science and Clinical Research**
  - **—Sponsored Programs**
- **Management**
  - **—Administrative Records**
  - **—Affiliations**
  - **—Faculty Committees**
  - **—Faculty Practice Plan**
  - **—Financial**
  - **—Student Records**

8. Encourage faculty development in medical computing.
9. Explore the possibility of establishing a Division of Medical Computing.

Excerpts from the Report of the Medical School Committee on Computers in Medical Education

With the exponential growth of information relevant to clinical patient care has come significant advances in the availability of usable and affordable microprocessor-based devices to gain access to this information. It is now becoming imperative that the well-trained clinician must have the ability to be able to understand and utilize at least fundamental applications of these techniques. It is therefore the recommendation of this Committee that plans be instituted immediately to generate a means to provide this exposure to Georgetown clinicians at both undergraduate and postgraduate levels. This represents a statement-in-prinicple of the approach felt to be most appropriate for Georgetown at this time.

1. Computer Literacy

The Medical School should develop a definition of computer literacy (see definition below in #2).

- Definition of computer literacy should be broad-based and include basic understanding of hardware/software concepts, computer resources in medicine, skills for using a variety of computer systems in medical education and medical practice, and basic understanding of computer programming skills.
- The best pathway to computer literacy is experience using computers in medicine.
- Students should be provided with a list of skills, knowledge and experiences which they should have acquired by the time of graduation, and a mechanism should be developed for monitoring the demonstration of computer literacy among Georgetown graduates.

2. Definition of Computer Literacy for Medical Students

To become computer literate, medical students must demonstrate:

A) A basic understanding of the concepts behind mainframe, mini and microcomputer hardware to include:
   a) the general differentiating definitions of each;
   b) the capabilities of each;
   c) access devices including terminals and modems;
   d) storage devices e.g. floppy diskettes, etc.;
   e) output devices e.g. printers, terminals, etc.;
   f) the concepts behind computer networking.
B) Basic skills in the use of computers to include:
   a) the use of memory storage;
   b) the use of file structures and types;
   c) competent use and understanding of a terminal and its specialized keyboard;
   d) competent use of a floppy diskette to store and retrieve programs or files;
   e) competent use of an information retrieval system via telephone hook-up.
C) The ability to use computer applications in:
   a) data entry for patient records;
   b) case simulations;
   c) diagnostic databases;
   d) word processing;
   e) electronic mail;

f) electronic spread sheets;
g) personal information organizing systems;
h) patient monitoring systems.

Implementation Steps:
Opportunities to Demonstrate Computer Literacy for Medical Students

Instruction Programs

1st Year
  Personal Information Systems (PIMMS)
  Library Information Systems
  Financial Aid Office

2nd Year
  All of the above plus
  Diagnostic Databases

3rd Year
  All of the above plus
  Hospital Information Systems

4th Year
  All of the above plus
  Case Simulations

Functional Goals of the School of Dentistry

Present Computer Systems

The School of Dentistry is currently involved in an analysis of its computer system. It presently has a Dental Clinic Network consisting of sixteen (16) terminals and a central processing unit which is a minicomputer located in Jacksonville, Florida with access through an AT&T dedicated telephone line. The approximate capacity of the system is 256.4 megabytes. The minicomputer system functions to provide information relating to patient demographics, financial records, chart location and control, and student evaluations and grading.

More recently microcomputer units have been purchased and are currently operating in various administrative areas. These autonomous units perform functions that meet the individual needs of each area such as word processing, grading and student evaluations. The School's objective is to allow information to be exchanged between the two systems. The minicomputer system will remain specific for patient records. The microcomputer will function to satisfy departmental and administrative functions relating to student evaluation, grading, word processing and other needs of each department.

Plans for Future Development

The Integrated Academic Information Management System project dovetails beautifully with current and future information systems planning in the Dental School. The number of entering students with computer literacy is increasing on a yearly basis. The school plans to meet their educational expectations by providing them with hands-on tools to enhance the modalities of information retrieval available to them. Integration of these advanced information skills in the curriculum and classroom teaching has been a tradition in the School of Dentistry. It was the first school to experiment with audiovisuals in teaching and it plans to pioneer in use of the advanced technologies available through IAIMS. Establishing the ideal workstation of the future is a high priority project.

OBJECTIVES

EDUCATION **PATIENT CARE** **RESEARCH** **MANAGEMENT**	**To utilize the unique services of IAIMS to enhance the School's programs in education, patient care, research and management as they relate to the field of dentistry. Of primary focus will be experiments in development of workstations equipped with advanced communications and computer capabilities for educational purposes.**

Program plans include the following:

- To develop a link that will permit immediate access to literature from library resources to benefit not only students but faculty.
- To begin initiating a workstation in a departmental area as part of the IAIMS pilot. Initially, this workstation will consist of a microcomputer terminal, printer and related peripherals that will be linked to existing databases in the Dahlgren Library. The configuration will change as other technologies become available.

- To expand the workstation concept throughout the Dental School and extend it for remote access from home, dorms and offices.
- To experiment in long range programs to develop advanced high technology "workstations of the future" suitable for transmission of data, voice and images for dental education.
- To encourage faculty to develop educational software applicable for their courses.
- To offer opportunities for faculty to take the library's courses on use of personal computers.
- To encourage departments to engage in database development through their local microcomputers and to determine which databases should be integrated for general school use.
- To continue development of the Dental Clinic computer system for patient records, research and administration.

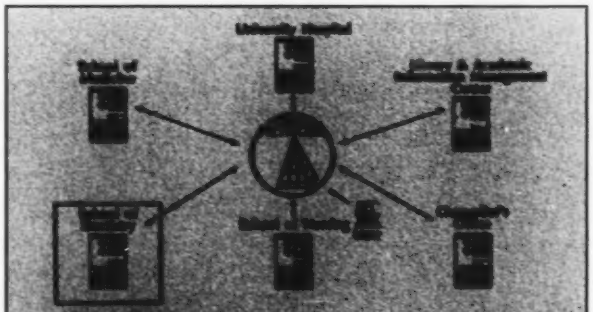
To support the activities cited above, the School of Dentistry envisions the need to work with the IAIMS projects to assure that databases and decision support systems needed to accomplish its tasks are launched. The databases are similar to those of the School of Medicine, but they must be supplemented with specific Dental databases to meet the needs of the Dental Clinic, Dental Supplies and Dental Research programs. They are outlined in Figure 7.

Educational and Research Plans

Students and faculty involved in research or clinical projects will be able to supplement their knowledge with that obtained through the workstation. Students and faculty will gain hands-on experience with computer systems and become proficient in database development and information management. The School perceives this academic approach of providing multiple user stations throughout the Dental School departments as the first step in the IAIMS project. These stations, linked to each other as well as networking with computers throughout the Medical Center, will result in the inproved transmission of information flow needed to achieve Stage I of Technological Development. IAIMS will serve as an invaluable tool in enhancing the educational perspective of all individuals involved with dental curricula and the ultimate transformation to Stage II and Stage III.

Future program plans related to dentistry are dependent on technological breakthroughs anticipated in the telecommunications field for image transmission. The school will explore partnerships with industry and the federal sector for research opportunites in this area to advance teaching and to improve patient care.

FIGURE 7
The School of Dentistry



- Education
  - —Clinical Simulations
  - —Continuing Education System
  - —Medical Computing
  - —Personal Information Management
- Patient Care
  - —Clinical Databases
  - ——Clinical Patient Records
  - —Dental Supplies
  - —Diagnostic Imaging
  - —Expert Systems
- Research
  - —Basic Science and Clinical Research
  - —Dental Research
  - —Sponsored Programs
- Management
  - —Administrative Records
  - —Affiliations
  - —Faculty Committees
  - —Faculty Practice Plan
  - —Financial
  - —Student Records

Functional Goals of the School of Nursing

Present Computer Systems

For administrative functions the School of Nursing has two IBM Displaywriters being used by the office staff for composing examinations, reports and grants. For educational and research functions the School has acquired several personal computers (IBM ATs and IBM-PCs) for use by the faculty for record keeping, student information, letters and research projects. Software purchased provides word processing and computation capabilities. The School established a computer laboratory for use by students and faculty to gain familiarity with automated systems.

In addition, the School has arrangements with the main campus Computer Center for their undergraduate and graduate students to use the microcomputers there to become computer literate and perform simple research problems. The Medical Center librarians provide seminars for faculty on access to the Dahlgren Library Information System from the terminal located at the School of Nursing computer laboratory. The Library also provides courses in the use of Personal Computers for Nursing.

Plans for Future Development

The School of Nursing administrators and faculty plan to develop a variety of information functions, some as part of IAIMS and others as part of the five year plan to meet internal needs of the School's programs. Once the basic functions are established, the flow of information and the links for appropriate exchange will be selected and prioritized for implementation. The initial goals focus directly on basic educational programs because the school recognizes the need to elevate the capability of students and faculty to cope with the sophisticated systems currently emerging in the nursing field. The basic objectives and tasks foreseen are listed below.

OBJECTIVE

EDUCATION PATIENT CARE RESEARCH MANAGEMENT	**To promote the use of computers and communications system in a coordinated fashion in the programs of the School of Nursing by integrating these advanced technologies in education, patient care, research and management. To start a program in computers in the Nursing Curriculum by integrating computer technology in the school's courses and by developing and implementing IAIMS sponsored projects.**

Activities planned include to:

- Establish an educational model entitled "Concepts in the Curriculum Model." See Figures 8 and 9.
- Integrate computers in the Graduate Nursing Administration Program by offering a basic course on Essentials of Computers for Nurses.
- Integrate computer technology in four existing Nursing Administration Courses
  1. Nursing Research
  2. Methods of Nursing Administration
  3. Financial Management, and
  4. Field Practice.
- Offer an Advanced Course in Developing a Computerized Nursing Information System.
- Offer basic courses for Nursing students and explore a special computer technology minor as an elective.
- Sponsor continuing education workshops and conferences on use of computers in Nursing.
- Conduct special faculty development workshops, provide consultation and assistance in integrating computers in their courses.
- Engage in research projects to advance computer systems software for nursing programs and to facilitate individual faculty in nursing research.
- Develop a Management Information System for the Nursing School to handle administrative functions more efficiently. Database development is planned as part of this function.
- Expand the existing computer laboratory in the school.

FIGURE 8

Computers in the Curriculum Model

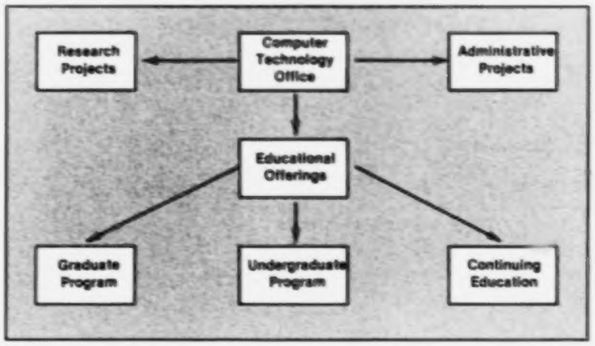
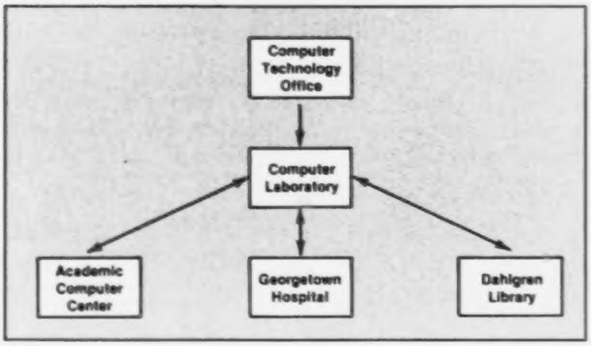


FIGURE 9

Computers in the Curriculum Model Structure



- Engage in research projects to advance computer systems software for nursing programs and to facilitate individual faculty in nursing research.
- Develop a Management Information System for the Nursing School to handle administrative functions more efficiently. Database development is planned as part of this function.
- Expand the existing computer laboratory in the school.
- Collaborate with the University's Academic Computer Center and the Medical Center Library to develop educational packages and to instruct students on use of the systems.
- Develop special IAIMS sponsored projects to support the needs of the schools. Two programs envisioned are the "Nursing Clinical Case Simulation Program for Nursing Techniques" and development of a "Nursing Nomenclature Database."

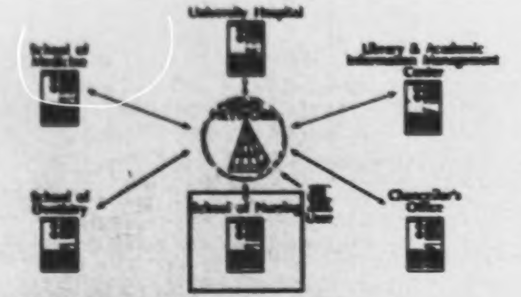
The databases to be developed or acquired are outlined in Figure 10. They are similar to those of the other Medical Center schools with the addition of the extensive project to integrate computer technology courses and develop the model program for all levels of nursing education.

IAIMS Nursing Projects

In relation to the IAIMS projects in nursing, the Nursing Clinical Case Simulation Program is being designed for the undergraduate nursing techniques course. It will use an authoring system called NEMAS. NEMAS is designed for the nursing process, and was developed by Susan Grobe at the University of Texas at Austin. The course will use existing CAI software that teaches nursing skills such as "Calculate with Care" and "Skills Simulation" available from J.B. Lippincott, Co.

FIGURE 10

The School of Nursing



- **Education**
  - **—Clinical Simulations**
  - **—Computer Technology Courses**
  - **—Continuing Education System**
  - **—Medical Computing**
  - **—Personal Information Management**
- **Patient Care**
  - **—Clinical Databases**
  - **—Diagnostic Imaging**
  - **—Expert Systems**
- **Research**
  - **—Basic Science and Clinical Research**
  - **—Sponsored Programs**
- **Management**
  - **—Administrative Records**
  - **—Affiliations**
  - **—Faculty Committees**
  - **—Faculty Practice Plan**
  - **—Financial**
  - **—Student Records**

The program for the course will be designed using both the NEMAS authoring system to format the content and the existing CAI to teach the actual nursing techniques. The software package will provide a complete teaching program for this required basic nursing course.

The proposed nursing nomenclature database will be designed as an educational reference tool that can be added to the databases accessed by all of the IAIMS users at the Medical Center. In fact, it might be considered as a mini-expert system for nursing. It will integrate:

1. The INI Nursing Thesaurus
2. The MeSH—N codes used by MEDLINE

3. The Nursing Dictionary, and
4. Other nursing terminology.

This nursing database will provide defined terms that characterize nursing. It will be an invaluable educational resource for nursing students and the nursing profession.

Functional Goals of the University Hospital

Present Computer Systems

The Hospital recently upgraded its entire computer system by adding an IBM 4381 to interface with its 6 Data General computers (3 Eclipse mini 350 and 3 MV 8000). The Hospital Information System, a sophisticated system maintained by CompuCare, has many advanced features not available in typical systems. In addition, the system is being enhanced to track DRGs and other records valuable for management decision making.

The following section describes in brief the various data processing systems currently operational at Georgetown University Hospital. Figure 11 is a graphic representation of the systems that will be discussed as well as their interrelationships. These systems can be grouped into three major categories:

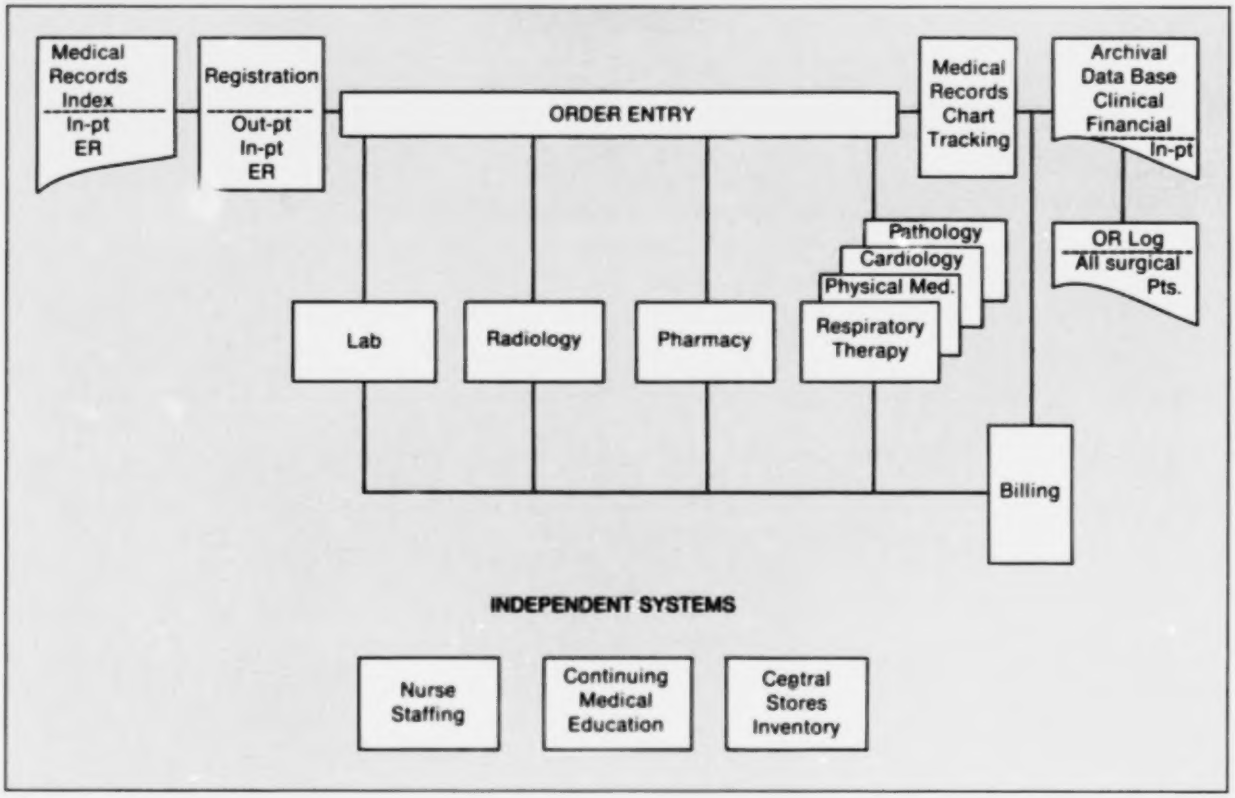
I. Administrative
II. Clinical
III. Financial

The Administrative Systems include:

1. Admitting System
2. Emergency Room and Outpatient Registration
3. Medical Records Chart and Deficiency Control System
4. Nurse Scheduling System

FIGURE 11

The Hospital Information System
March 1983


Medical Records Index
In-pt
ER
Registration
Out-pt
In-pt
ER
ORDER ENTRY
Medical Records Chart Tracking
Archival Data Base Clinical Financial
In-pt
Pathology
Cardiology
Physical Med.
Respiratory Therapy
OR Log
All surgical Pts.
Lab
Radiology
Pharmacy
Billing
INDEPENDENT SYSTEMS
Nurse Staffing
Continuing Medical Education
Central Stores Inventory

The Clinical Systems include:

5. Laboratory System
6. Pharmacy System
7. Other Ancillary Result Reporting System (Radiology, Cardiology, Physical Medicine, etc.)
8. Demographic, Clinical Financial Database for Inpatients
9. OR Database

The Financial Systems include:

10. Patient Billing
11. Laboratory and X-ray Billing
12. Hospital Accounting System

Plans for Future Development

The Hospital Information System, developed and installed at Georgetown University Hospital over the last 10 years, has increased efficiency in data handling and improved productivity throughout the Hospital. The new IBM 4381 with the Model 204 Database Management System will offer a number of powerful advantages. Specifically, two improvements are high performance and user productivity. A Statistical Analysis System (SAS) also added allows scientists to conduct Epidemology Biostatistical studies for clinical research. The goals over the next ten years are to continue improvement in these areas by constantly incorporating programmerless capabilities, a natural language approach and integration of databases. The basic objectives and activities foreseen are listed below:

OBJECTIVES

PATIENT CARE
EDUCATION
RESEARCH
MANAGEMENT

To enhance and further develop the Hospital Information System (HIS) to accelerate the transfer of patient information to health care providers and to facilitate the organization of clinical information through automated means in order to conduct education, patient care, research and management functions more efficiently.

Specifically, the Hospital will address the following areas:

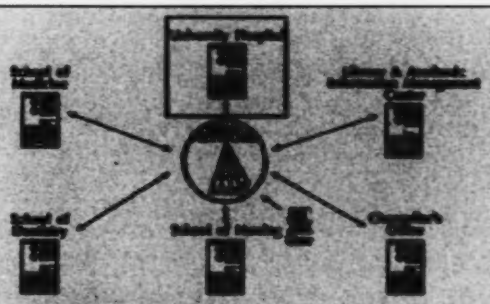
- Reduction in communication delays between the providers and receivers of services
  a. installation of order entry and results reporting for all ancillaries
  b. increased involvement by physicians and nurses with order entry
  c. order explosion
  d. preliminary and final result transmission on all floors
  e. terminals in remote outpatient areas for ordering and resulting physician message system
- Improvements in productivity of data handling in the Hospital
  a. online patient charting
    (1) online medication administration
    (2) drug-drug, drug-allergy, drug-lab interactions
    (3) vital sign tracking
    (4) nursing notes
    (5) patient care plans
  b. integration of word processing and data processing applications
- Improvements in analysis capabilities for clinical and financial data
  a. DRG/Case mix analysis
  b. Utilization Review analysis
  c. Online Database Management System of both financial and clinical information retrieval
- Develop applications for the microcomputer environment and develop links between the mainframe for downloading data to and from the micros
- Expand the present database systems to include treatment protocols and follow-up outcomes
- Provide electronic admissions capabilities to community physicians from remote sites
- Develop IAIMS projects to accelerate automation of clinical departments
- Provide LAN access to HIS to authorized users such as the Lombardi Cancer Center and the Department of Neurology involved in IAIMS projects
- Implement natural language capabilities as available

- Study means of reducing redundancy by integrating and refining clinical databases.

The databases supporting education, patient care, research and management are illustrated in Figure 12. Plans are to build on these and add the services highlighted above.

A number of technical research opportunities resulting from the IAIMS project will impact on the hospital system. The installation of the LAN will introduce communications and interface problems that will require the attention of skilled staff with networking talents. Also, the linking of diagnostics equipment to the hospital's computers for real time studies will require complex technical work to be achieved. Because the hospital already has a sophisticated system in place, it can look toward future involvement in technical experiments that may represent a major contribution toward the IAIMS concept.

FIGURE 12
The University Hospital



- Education
  - —Clinical Simulations
  - —In-Service Training
  - —Patient Education
- Patient Care
  - —Diagnostic Tests
  - ——Medical Records
  - —Pharmacy
  - —X-Rays
- Research
  - —Clinical Studies
  - —Protocols
- Management
  - —Billing System
  - —DRGS
  - —Administrative Records

Functional Goals of the Academic Information Management Center in the Medical Center Library

Present Computer Systems

Since 1980, the Dahlgren Memorial Library has engaged in pioneering work to improve information management and access of recorded knowledge by designing a Library Information System (LIS) using an integrated approach. Through a team effort of librarians, computer scientists and health professionals who engaged in research and development, the library designed and implemented an online bibliographic system for handling library operational functions. The functional components of LIS represent the only known "total system" available today using a master bibliographic record. It includes an online catalog, serials control, acquisitions, cataloging, circulation, interlibrary loans (networking), accounting, word processing and the miniMEDLINE SYSTEM (TM), a self-service bibliographic search system using a subset of the MEDLINE file.

This early work enabled the library to provide new services previously unavailable to users such as: miniMEDLINE, remote access (direct and dial-up), electronic messaging, interlibrary loans and development of special databases such as the Pharmaceutical Information Exchange (PIE), Fellowship and Scholarship database and a Reserve Room reading list. Plans are to extend LIS by developing a Neurosciences database and to experiment with Cancerliterature/CancerExpress and PDQ (Physician Data Query) for the IAIMS program.

LIS is written in ANSI MUMPS language and operates on a PDP 11/44 minicomputer with CPU of 3 Mbytes and three disk drives of over 1 Gigabyte. Essentially all staff workstations are automated and approximately 10 public area workstations are available to users. In addition, three workstations at remote sites of the Medical Center have access to the LIS.

The Library has achieved Stage I and has progressed to Stage II. Staff expertise in systems design, programming and technical management of computers is already sophisticated. There are 8 full time programmers that maintain LIS for Georgetown as well as for 15 libraries that have replicated the system at their institutions.

A pilot project to teach computer access skills was initiated in 1981 and this was followed by development of a small computer section established in the Audiovisual Learning Center of the Library in

1982 where courses on use of computers are currently being conducted. The Library currently has 13 personal computers consisting of Apples, Macintoshes and IBMs.

Plans for Future Development

The Library will be the Medical Center unit to experience the most change as a result of its transformation to an Academic Information Management Center (AIMC) for IAIMS. New services and new roles will be undertaken by the librarians. Core support services, training, new databases, and unique approaches to information handling will be "Library"/ AIMC functions. In addition, personnel patterns will differ as other health professionals, computer experts, and technical engineers become part of the "library" staff.

The Library plans to build from its strong foundation of an online integrated Library Information System and continue development of additional functions to enhance its current capabilities. These include the following:

1. Networking from multiple sites, internally and externally.
2. Involvement in additional database development.
3. Expansion of educational programs in computer competency.
4. Engage in on-demand publishing.
5. Consider innovative approaches to learning, such as videodisk and other technologies as they become available.

Of the four major areas of Medical Center activities, education, research, patient care and management, the pilot phase of IAIMS will have its major concentration initially in the educational and patient care applications. This concentration in education and patient care is the most logical first step in that, at this level, Georgetown shall be introducing the use of modern technologies to "tomorrow's health professionals." In order to do this effectively, Georgetown needs also to impact on faculty and staff. This will be done through the proposed Academic Information Management Center (AIMC). The objectives of the AIMC are as follows:

OBJECTIVES

ACADEMIC INFORMATION MANAGEMENT CENTER	**To begin to establish a well-equipped, full-fledged Academic Information Management Center (AIMC) in the library on use of modern electronic technologies in education, patient care and research. The focus will be core support services, training and education on use of computers and data transmission.**

This includes detailed planning to:

- Enhance and further develop existing educational software programs available to students, faculty and research staff at Georgetown, i.e., clinical case simulation, the miniMEDLINE SYSTEM (TM), and the Pharmaceutical Information Exchange (PIE).
- Conduct major training sessions for faculty, staff, students and administrative executives so that Medical Center campus-wide "computer literacy" can be achieved.
- Develop a modern library-based computer training facility with sufficient space to accommodate a laboratory for large teaching programs, to provide an environment suitable for research in use of computer technologies, and to permit a variety of learning opportunities at different types of workstation situations.
- Teach users information access skills to the IAIMS network as well as to external databases supplied by vendors and other institutions, e.g. AMA/GTE.
- Accommodate the Continuing Education courses to include Information Management for health professionals.
- Lend microcomputers and software to faculty interested in developing educational programs that can be utilized by their students.
- Provide a consulting service on selection of hardware, software and design of systems for the Medical Center users. Demonstrations of available systems will be arranged at the training center laboratory.
- Develop and implement core support services such as a directory of databases, bulletin board, word processing and electronic mail, and train users to access.

Figures 13 and 14 illustrate the number of activities and services to be conducted in the AIMC for Medical Center users.

The Academic Information Management Center Users are:

AIMC USERS

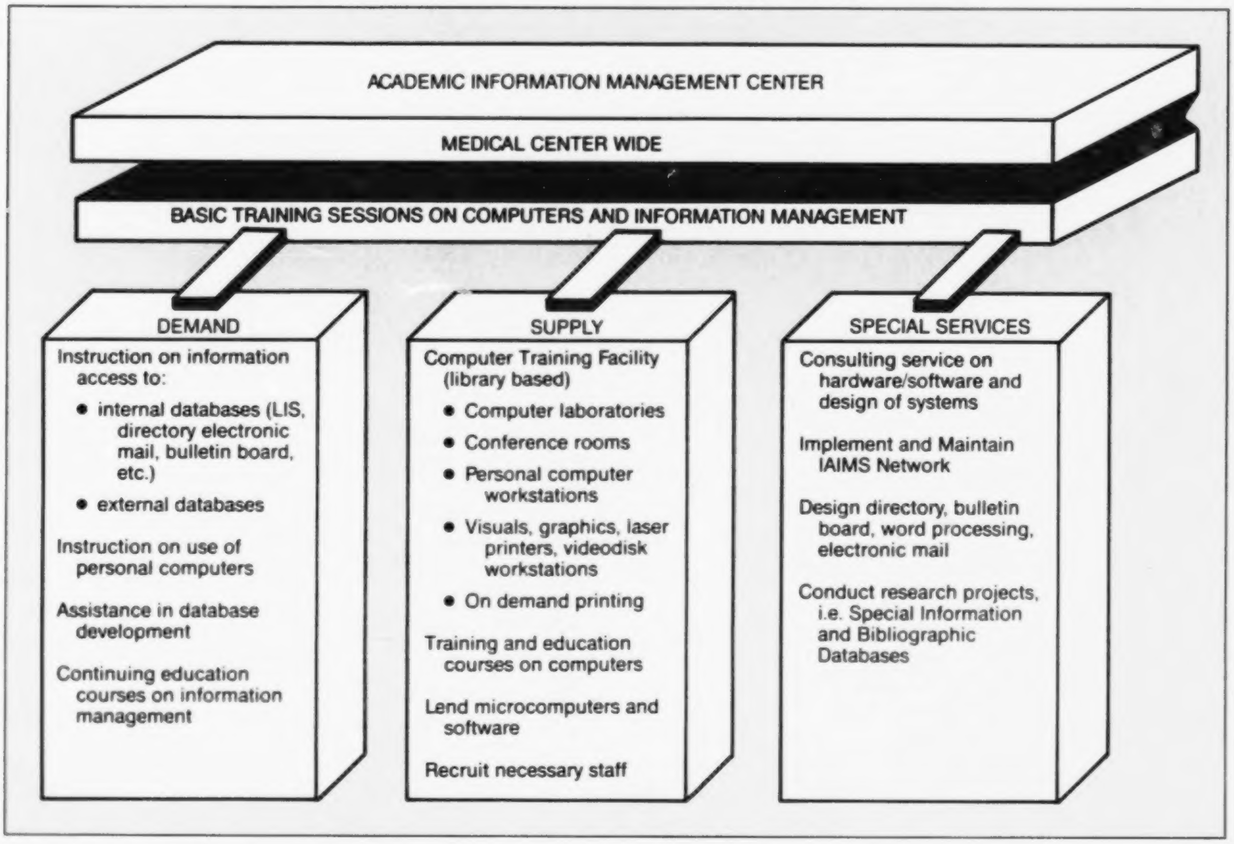
- **All GUMC students, faculty, researchers and staff**
- **Affiliated hospitals and D.C. universities with academic medical centers**
- **Continuing Education participants**
- **Special training program attendees.**

The training and computer information service aspects of the proposed Academic Information Management Center (AIMC) are already partially operational. Begun as trial projects in the library, these activities are currently being expanded through an NLM grant. Because the current demand and need to provide training opportunities throughout the Medical Center is accelerating so rapidly, it is vital that this project be broadened even further. By incorporating training in the pilot IAIMS the relationship between basic "computer literacy" and development of sophisticated information-seeking skills will be achieved with the greatest degree of potential success. These activities support the educational and patient care mission of IAIMS.

The thrust of inquiries from faculty, researchers, residents and students is more numerous than previously envisioned. The AIMC concept will be imple-

FIGURE 13

The Academic Information Management Center


ACADEMIC INFORMATION MANAGEMENT CENTER
MEDICAL CENTER WIDE
BASIC TRAINING SESSIONS ON COMPUTERS AND INFORMATION MANAGEMENT
DEMAND
Instruction on information access to:
• internal databases (LIS, directory electronic mail, bulletin board, etc.)
• external databases
Instruction on use of personal computers
Assistance in database development
Continuing education courses on information management
SUPPLY
Computer Training Facility (library based)
• Computer laboratories
• Conference rooms
• Personal computer workstations
• Visuals, graphics, laser printers, videodisk workstations
• On demand printing
Training and education courses on computers
Lend microcomputers and software
Recruit necessary staff
SPECIAL SERVICES
Consulting service on hardware/software and design of systems
Implement and Maintain IAIMS Network
Design directory, bulletin board, word processing, electronic mail
Conduct research projects, i.e. Special Information and Bibliographic Databases

mented immediately in the first year so that users have a focal point from which to begin using the new technological tools appearing almost daily. Something as basic as consulting assistance in selection of microcomputers is needed for faculty and departments planning to acquire hardware and software.

The data communications system is, of course, central to the core services that can be provided by the AIMC. Without an electronic transmission system the AIMC simply cannot function effectively. Already evident in the library are numerous requests for remote access to the Library Information System (LIS) and the Hospital Information System (HIS).

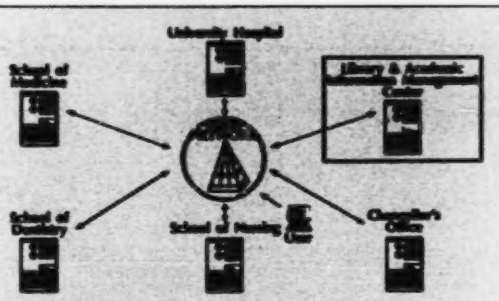
IMPLEMENTATION STEPS OF THE AIMC

Careful planning for development of the Academic Information Management Center includes a series of steps to be implemented by the Library in a number of phases. The steps are as follows:

1. Organize a Subcommittee of the Library Committee and Librarians to plan creation of the AIMC.

FIGURE 14

The Library and Academic Information Management Center



- **Education, Patient Care and Research**
  - **—Bibliographic Databases**
  - **—Computer Graphics**
  - **—Computer Training**
  - **—Knowledge and Information Databases**
  - **—Medical Diagnostic Systems**
  - **—Personal Information Management System for Students**
  - **—Video Disks and Laser Disks**
- **Information Services**
  - **—Directory of Databases**
  - **—Electronic Interlibrary Loans**
  - **—Electronic Reference**
  - **——Faculty Publications**
  - **—Network Access to External Databases**
- **Management**
  - **—AIMC Services**
  - **—Financial**
  - **—Friends of Library**
  - **—Library Administration**

2. Determine the best approach for meeting space needs required for this programmatic endeavor. This includes acquiring architectural as well as computer and communications expertise outside the institution. Plans include a phased approach:

   Phase I calls for:

   - Remodelling the existing library facility in the AV Center and group study area of the library. (See Figures 15 and 16)
   - Storing low-use materials off campus to free space for AIMC.

   Phase II includes:

   - Adding space to the existing library or expanding the building by adding the two floors it is stressed to maintain.
   - Establishing major training and computer facilities on the new floors to provide services to the community as well as Georgetown users.

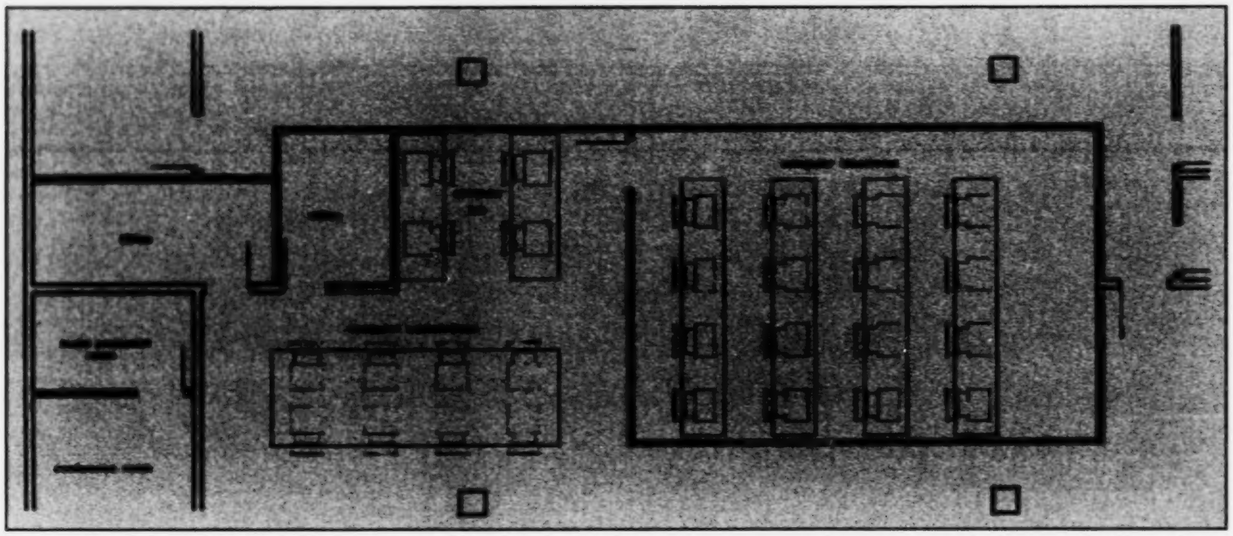
3. Implement training sessions for faculty, staff and students. This includes maintaining workstations, labs and teaching rooms, microcomputer hardware, software and human resources.

4. Design the courses in detail to include at least five levels of computer competency:

   - Basic Knowledge
   - Ability to use IAIMS
   - Use of Applications Systems
   - Database development instruction
   - Design of educational software.

5. Acquire microcomputers for use in the AIMC and also to lend to users. Equipment for the AIMC will include visual and graphic capabilities so that users can optimize the Center's proposed ser-

FIGURE 15
AIMC Phase I Floor Plan

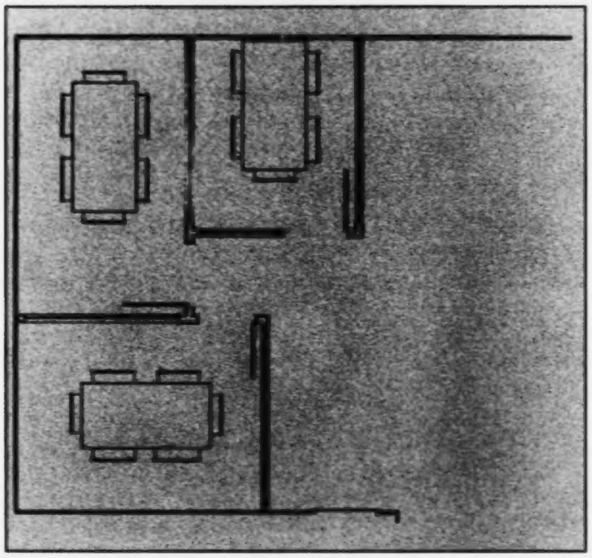


vices. The Library's minicomputer system will also require upgrading to support IAIMS core services.

6. Determine policies for management of the AIMC and especially identify the degree of consulting assistance to be provided by the AIMC staff.

7. Plan, design and implement software that provides a gateway to IAIMS. This will be a basic directory of databases with brief instructions for new users. Other items to be included are bulletin board, word processing and electronic mail. The bulletin board directory and word processing elements are not expected to generate an immense workload. Electronic mail, however, may generate more work than the library could comfortably handle at the present time. Therefore, plans are to evaluate this service closely.

FIGURE 16
AIMC Group Study Rooms Floor Plan



Functional Goals of the Office of the Chancellor of the Medical Center

Present Computer Systems

Automated services utilized in the Office of the Chancellor are diversified, unique and of a smaller scale than the other units of the Medical Center. There are three approaches used for functional programs:

1. Internal office operations are conducted through a series of workstations consisting of word processors and letter quality printers. Also, a personal computer is used for financial planning.
2. External functions such as monthly financial rec-

ords, affirmative action, development programs and personnel records are handled by the University's Computer Services Department.

3. Radiation Control for the Medical Center is maintained on a 68000 super microcomputer system through a sophisticated software system based on the VA File Manager.

Plans for Future Development

Through the IAIMS network a number of computer projects will be launched to improve the flow of information between the Chancellor's Office and the Schools, Library and Hospital, as well as the Main Campus. In addition, there is a possibility that the approach used for the Radiation Safety system can be applied to other offices.

OBJECTIVE

MANAGEMENT **The major objective of the Office of the Chancellor is to utilize advanced technologies to improve the administrative, management and planning functions of the Medical Center. The Office of the Chancellor currently maintains a number of centralized databases and management systems, but few of these are automated. Plans would be:**

- To convert existing paper systems to automated systems using a relational database systems approach.
- Through the IAIMS network, direct access to selected information would be provided to other units of the Medical Center.
- The planned telecommunications system, once operational, would be utilized to provide a link between the Chancellor's Office and Main Campus databases, such as the Office of Development files and to the University financial system. The Chancellor's Office could then download needed data from these systems and transfer it using the IAIMS network to other units of the Medical Center.

The databases to be developed are outlined in Figure 17. They are primarily management databases focusing on the programs of the Medical Center and its relationship to the University and to the Washington, D.C. metropolitan community.

Plans for Implementing the Network System*

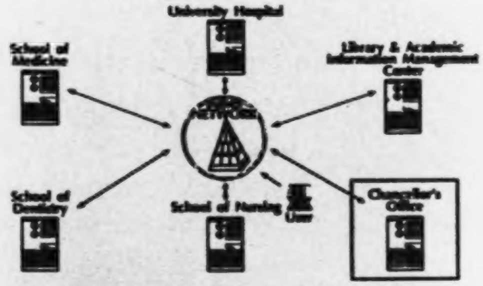
Background and the Baseline

A critical step in the development of the strategic plan for the IAIMS network is the development of a baseline which states the fundamental requirements and directions to be specified and the system architecture for the implementation plan. The baseline developed in March, 1984 included:

- An updated inventory of the information sources, systems and services.
- The information flow for the various units of GUMC as well as an overall information flow for GUMC.

FIGURE 17

The Chancellor's Office



- **Education, Patient Care and Research**
  - **—Accreditation Records**
  - **—Affiliated Institutions**
  - **—Alumni**
  - **—Calendar of Medical Center**
  - **—Faculty Information System**
  - **—Radiation Safety**
- **Management**
  - **—Affirmative Action**
  - **—Development**
  - **—Facilities**
  - **—Finance**
  - **—Government Relations**
  - **—Legal**
  - **—Planning**
  - **—Policy**
  - **—Public Relations**

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*This part was prepared by Sigma Associates as a subcontract.

- A first cut at the long-term information flow scenarios.
- The environmental forecast covering the prospective environment in which GUMC will be operating.
- The basic GUMC goals and objectives as reflected in its current Long Range Plan.
- A first cut at the impact that IAIMS could potentially have on each of the specific goals and objectives of that Long Range Plan.
- The policy issues that were identified relative to IAIMS and the latest statement regarding those policy areas.
- The primary considerations, characterizations and other ground-rules for the implementation phases.

IAIMS Architecture

After review of the Baseline and consensus by the IAIMS Development Team, the overall architecture of the IAIMS system was developed. This involved consideration of and trade-offs among:

- The distribution of intelligence (computer power) covering the spectrum from a highly centralized system (one large computer), to a totally decentralized system with a large number of computers geographically spread throughout the Medical Center.
- The location and distribution of the information sources (data bases and other sources of information).
- The basis for the movement of information within the campus and the transmission gateways to the outside world looking at alternatives such as many point-to-point connections versus a highly integrated network, a data only network, an integrated network handling voice, data, text and video, and the possible use of the PBX (telephone switch and its wiring).
- The degree of compatibility, standardization and inter-operability which would be required, desired or acceptable to the operational mode of GUMC.
- The implications of commonality of applications software, keyboards, and the various elements which interface directly with the user.
- The implications of the various alternatives on the requirements for redundancy and disaster planning.
- The implications of alternatives as they relate to ease of change, upgrade, and introduction of new IAIMS systems, databases, applications and usages.

The architectural effort included the underlying rationale and recommendations including relationship to the GUMC (or Georgetown University) telephone system and reflected the various implementation phases of the proposed IAIMS system.

Key Assumptions

The various analyses, recommendations and Georgetown decisions emerged from a common understanding and consensus of the key assumptions for development of the IAIMS plan.

This effort focused on the information technology systems aspect of the overall IAIMS implementation plan, its related activities and the timing of actions associated with policy definition and implementation, organization and process development.

System Implementation Plan

It was agreed that the Implementation Plan reflects GUMC's position regarding strategic planning and establishment of goals, directions, schedules and resource requirements related to those aims. It provides the basis for the fundamental decisions required to implement a network system; provides the framework for the operational planning and budgeting; and the schedule framework for implementation and identification of the major tasks and milestones (on a yearly basis) through the ten years of implementation.

Ongoing Activities on Policy, Organization and Process

The early self study efforts resulted in the identification of key policy issues related to IAIMS. These efforts continued throughout the development of the system implementation plan by obtaining input from the various GUMC units and departments for consideration and inclusion in the plan. This review will be an ongoing effort during implementation and IAIMS will be updated as required for changes occuring in the complex world of information technology and the need to assure privacy, confidentiality, etc.

The requirements for the organizational changes as well as processes for coordination, review and decision making to ensure an effective implementation and operation of IAIMS were identified. Alternatives will be considered, and actions identified and initiated in this regard.

After completion of the strategic IAIMS implementation plan, detailed planning for implementation of the pilot phases was scheduled as early as mid 1985.

The Implementation Phases of IAIMS

As highlighted previously, IAIMS is viewed in three essential phases. A long-term look of a decade hence, although general in nature, is developed to provide a long-term context for the earlier phases and to provide the forcing function in the planning process to think in global and visionary means to ensure that the strategic plan is not short-sighted.

While this long term plan sets general directions, the most reasonable time frame for a specific implementation plan is the Interim IAIMS which reflects the system and its usage in the 5-7 year time frame. Therefore, this is the basis for the implementation plan upon which schedules, activities, and resources required for implementation are based.

The initial phase of IAIMS, the Pilot implementation program, will start immediately upon the availability of funding. The initiation of the Pilot program testing and operation will be approximately 1 year from the completion of the overall IAIMS implementation plan. While this will be considered the pilot program as envisioned by NLM, the philosophy was adopted that all new applications, databases, systems and users would be introduced via "pilot programs" to use and evaluate that system or application as well as minimize any risks during implementation. Figure 18 graphically portrays the philosophy of that continued "pilot program" as a basis for evaluation and controlled introduction of new systems, databases, applications and users.

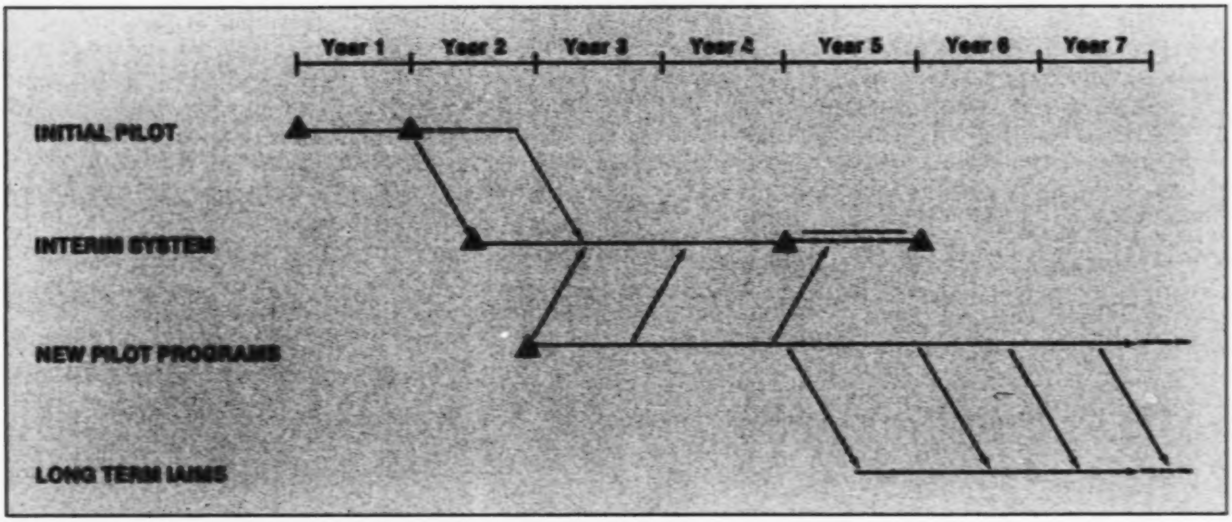
Considerations and Characteristics of The Implementation Phases

For each of the three phases of IAIMS (Pilot, Interim and Long-Term), the primary considerations and characteristics were articulated as part of the Baseline. The most general and long-term characterization of the IAIMS is first addressed. The groundrules for that Long-Term IAIMS program involve:

1. Long Range Phase

- The accomplishment of the full conjunction of academic and operational information sources for enhanced education, health care delivery and research within GUMC.
- The Long-Term IAIMS program implementation within ten years considering economic, technological and operational considerations.

FIGURE 18
IAIMS Program Overall Schedule



- Implementation based upon technology products and services which may not be available now on a cost effective basis, but which will be proven within the next 5 years such that they can be introduced at minimum risk.
- Where there are current policy or cultural impediments for the full implementation of IAIMS, these will be resolved on a timely basis sufficient to support this Long-Term implementation.
- Where there are decisions to implement aspects of the Long-Term IAIMS, there will be, as in earlier phases, a requirement to identify benefits. In most cases these will be subjective and non-quantifiable.

The characteristics of the Long-Term IAIMS program which could be in place within ten years are envisioned as:

- All forms of information including voice, image, text, data and video will be cost-effective in electronic form at some stage of their existence and utilization.
- The sources of information will be accessible from some set of electronic devices with no geographic restrictions.
- The movement of information will be via electronic means.
- All information is available across medical center units regardless of the degree of centralized or decentralized systems.
- The broad range of access and utilization will be based upon an acceptable level of control over access to information, ability to change and manipulate that information, and other critical policy issues identified in the early stages of IAIMS.
- The information available to IAIMS is that resident at GUMC, as well as medical information from other institutions on a national and international basis.
- Whereas GUMC will have access to information from other institutions its information in turn will be available on acceptable access, control and usage ground rules to institutions external to GUMC.
- The capability will also exist for consultation and training, with high bandwidth oriented systems such as video and imagery, on both a national and international basis.

2. Interim Phase

The Interim IAIMS program is characterized in more detail as one which could be operational within five years and will provide the beginning of a useful conjunction of academic and operational sources. The other ground-rules associated with the Interim IAIMS program are established as:

- Based upon currently proven technology products and services. This recognizes, of course, that as newly proven alternatives are established, they can be introduced to IAIMS at a future date.
- Including some evolutionary changes which will take place in current policy, operational and cultural considerations.
- Part of a broadly utilized system which includes a subset of all of the eventual capabilities of the Long-Term IAIMS.
- Built upon the initial pilot programs unless one or more of those pilot tests prove to be infeasible from an economic or operational standpoint. With the time frame of five years, this does allow additional candidate systems, databases, applications and users beyond those introduced in the initial pilot phase.
- Clearly related to goals and objectives of GUMC or for mitigation of those "threats" identified in the environmental statements.
- Beneficial before full initiation of any system, application or use on a full basis. The benefits will have been identified and established during a pilot phase. In many cases, this will be on a subjective and non-quantifiable basis.

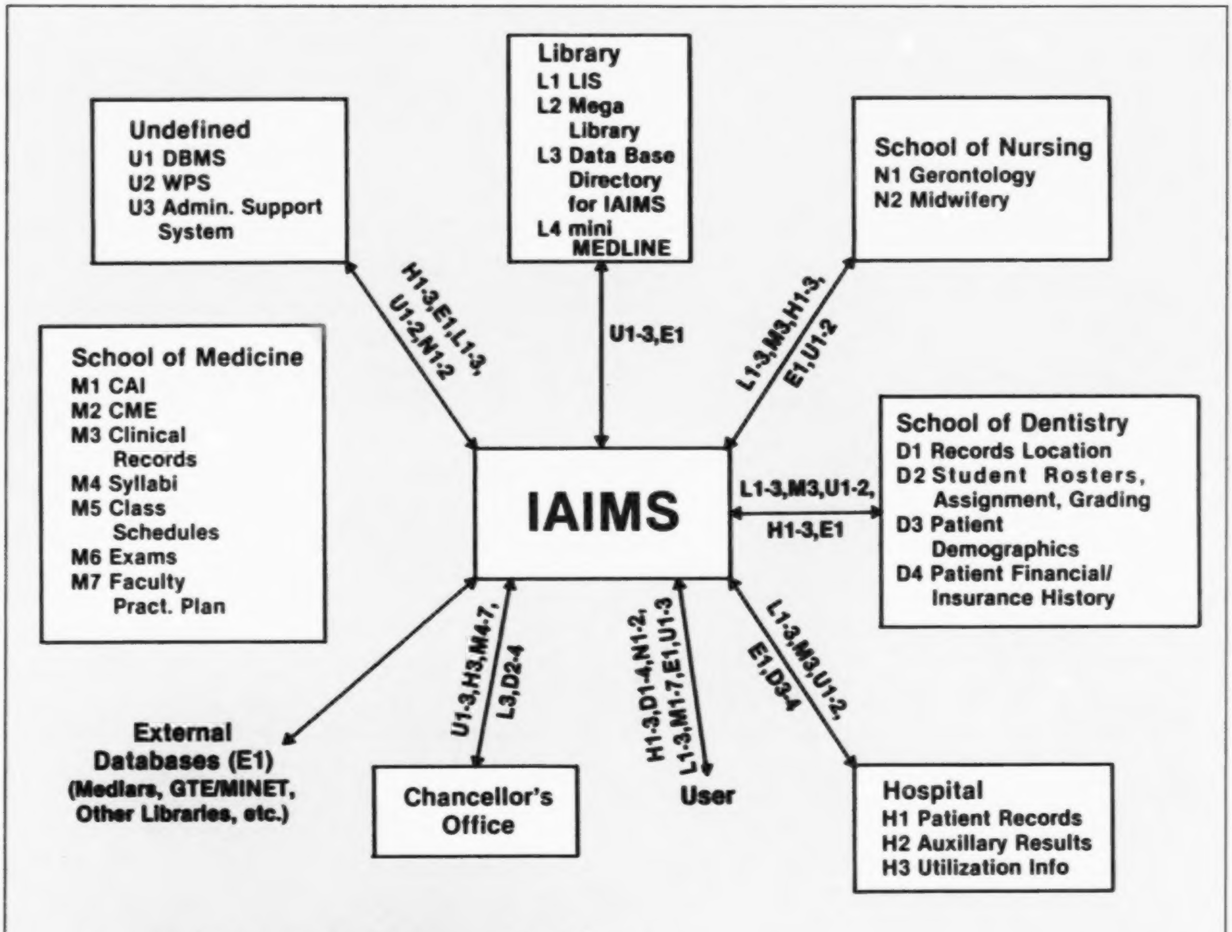
The Interim IAIMS program is envisioned as involving 40-60 databases online and accessible to a wide range of users. Access to the information sources and applications programs will be via 500-1,000 electronic devices supported by 5-8 mini or mainframe computers. There will be some common network access protocol that will improve the utilization of the IAIMS system.

Figure 19 reflects the overall information flow on a GUMC-wide basis envisioned at the early stages of the Interim program.

The operational aspects of the Interim IAIMS program include a number of considerations. The first is a greatly expanded number and level of information sources such as:

- Access to a "mega library" with bibliographic as

FIGURE 19
Interim IAIMS Overall Information Flow*


Library
L1 LIS
L2 Mega Library
L3 Data Base Directory for IAIMS
L4 mini MEDLINE
Undefined
U1 DBMS
U2 WPS
U3 Admin. Support System
School of Nursing
N1 Gerontology
N2 Midwifery
School of Medicine
M1 CAI
M2 CME
M3 Clinical Records
M4 Syllabi
M5 Class Schedules
M6 Exams
M7 Faculty Pract. Plan
School of Dentistry
D1 Records Location
D2 Student Rosters, Assignment, Grading
D3 Patient Demographics
D4 Patient Financial/ Insurance History
IAIMS
H1-3,E1,L1-3, U1-2,N1-2
U1-3,E1
L1-3,M3,H1-3, E1,U1-2
L1-3,M3,U1-2, H1-3,E1
U1-3,H3,M4-7, L3,D2-4
H1-3,D1-4,N1-2, L1-3,M1-7,E1,U1-3
L1-3,M3,U1-2, E1,D3-4
External Databases (E1)
(Medlars, GTE/MINET, Other Libraries, etc.)
Chancellor's Office
User
Hospital
H1 Patient Records
H2 Auxiliary Results
H3 Utilization Info

***Candidate Information Sources are indidcated. Final selection will be performed during implementation plan development.**

well as full text information available at the user location and delivered via electronic means.

- A wide range of external databases available to the GUMC community.
- Selected GUMC patient and clinical information will be available to authorized users. This would, of course, be accomplished via tested and accepted mechanisms for control of access and use of the information.
- Some level of controlled viewing of real-time events such as remote viewing of surgery on campus, observation of dental students in a clinical setting, etc. This viewing of real-time events would be constrained to on-campus at this stage of the IAIMS program.

There is also envisioned a greatly expanded network access system to these many information sources involving a pervasive placement of access devices within the hospital and on campus; at affiliated hospitals; and providing student, faculty and practitioner access from off-campus locations such as home or office.

Typical new uses of information anticipated in this time period are:

- A wide range of problem solving teaching aids which will provide students specific learning packages. This involves integration with research information, library information, "protected" patient information, statistical information on treatments in the hospital environment, analytical models, etc. There will be some process for feedback to the instructor on the logic process, analysis and conclusions made by the student via these problem solving teaching aids. And, there will be student access to this range of information and tools from a variety of remote sites such as dorms and off-campus dwellings.
- Demographic analysis of patient information for planning and measurement of health care cost; an information source for student problem solving and learning; and diagnostics and consultation for the practitioner and the general area of health care delivery.
- The ability to capture data from expanded information sources and incorporate these in personal information files.

During this Interim IAIMS period, the hospital role will be accelerated as issues of confidentiality of patient information and system security are resolved through new technological mechanisms.

Organizationally, the Interim IAIMS also includes the early establishment of an information policy and programs officer who will report to the Chancellor. The functions of this position, described previously, include:

- Participating in a GUMC-wide user committee.
- Coordinating the timely implementation of policy.
- Maintaining visibility (not control) over the installed base of systems, software, etc.
- Identification of beneficial areas of integration of information sources or systems on an ongoing basis.

It is recognized that the early establishment of this function is critical to the successful achievement of the IAIMS program. Also critical to a successful IAIMS is the expansion of the Academic Information Management Center (AIMC) in the Library. This requires construction of additional floors to the existing facility. While the organizational approach allows for other training sites to be maintained by the operational units, resources from IAIMS will be devoted to the central AIMC at the Library where functions and services include:

- Technical consulting and information dissemination on database development, equipment selection, etc.
- Technical training for the full range of users.
- Design, development and maintenance of the overall IAIMS system.
- Capturing and repackaging information for use by others.

3. The Pilot Phase

The Pilot Phase program is considered as the basis for providing the most practical and necessary first steps for the beginning development of the overall IAIMS program. The first cut includes the following general characteristics for that phase of the IAIMS program:

- There will be an expanded level of information sources available beyond the current Library Information System (LIS) including other on-campus databases as well as some non-GUMC information sources such as GTE Minet.
- There will be expanded access to those information sources involving students who can access from the dormitory or home via personal computers and faculty or practitioners who can access the information sources from the hospital, affiliated hospitals, the office, the educational office or the home.
- There will be the development of research clinical databases for one or two departments which initially will be controlled by that clinical department and limited in use to that department.
- New information tools will also be made available including personal computer training models for the AIMC; a personal information system which will provide students with the capability of developing a more formal set of "notes" during their educational tenure; a word processing capability for paper writing for student, practitioner and researcher; a database management system for individual or departmental development of databases; and some administrative software packages such as spreadsheets and statistical routines.
- The AIMC-Phase I will begin as an outgrowth of the existing audio-visual laboratory for computers. Remodeling will take place to accommodate more teaching space. Several personal computer work-stations and a computer lab will be added with appropriate support tools for training.

The overall information flow during the Pilot program will begin with the Library system and an IAIMS computer will be located there. The information flow on an IAIMS-wide basis is reflected in Figure 20. The "input/output diagram" for the Pilot program with focus on the Library Information System is reflected in Figure 21 and, Figure 22 reflects the current information flow and provides contrast for the level of augmentation for the Pilot program.

The characteristics of the Pilot Phase envisioned at this point involve having 4-6 databases or applications programs online; providing support to 40-50 electronic devices (personal computers, word processors, dedicated terminals) and 1-2 minicomputers; the establishment of a common network access protocol for the Pilot test; access to the databases for applications programs on a port contention basis (there will be no dedicated access except for those directly connected terminals in the Library); the network for the Pilot will be non-intelligent; that is, it would be the transmission medium only and would not provide protocol conversion. Other considerations include:

- A shared processor aspect of the Pilot program.
- Consideration to either providing personal computers to selected students for participation, or more appropriately, to provide access for students who own their personal computers, who will utilize the IAIMS system and its information sources and who will provide the necessary feedback on utilization, value, impact, etc.
- The current telephone system will be the basis for on-campus transmission except for the directly connected terminals in the Library. This involves a limitation on numbers of terminals accessing the IAIMS.
- There will be an evaluation process measuring

FIGURE 20

Overview of Pilot Information Flow

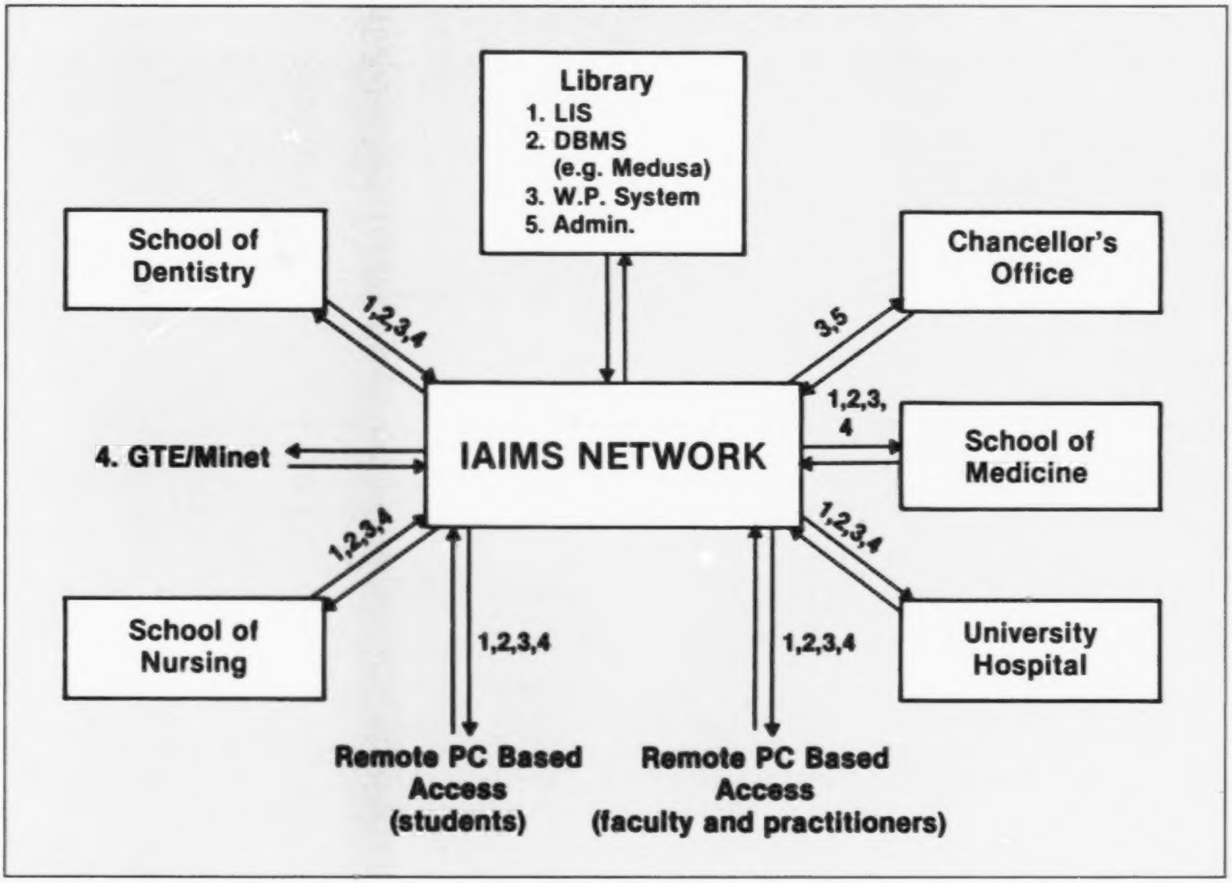
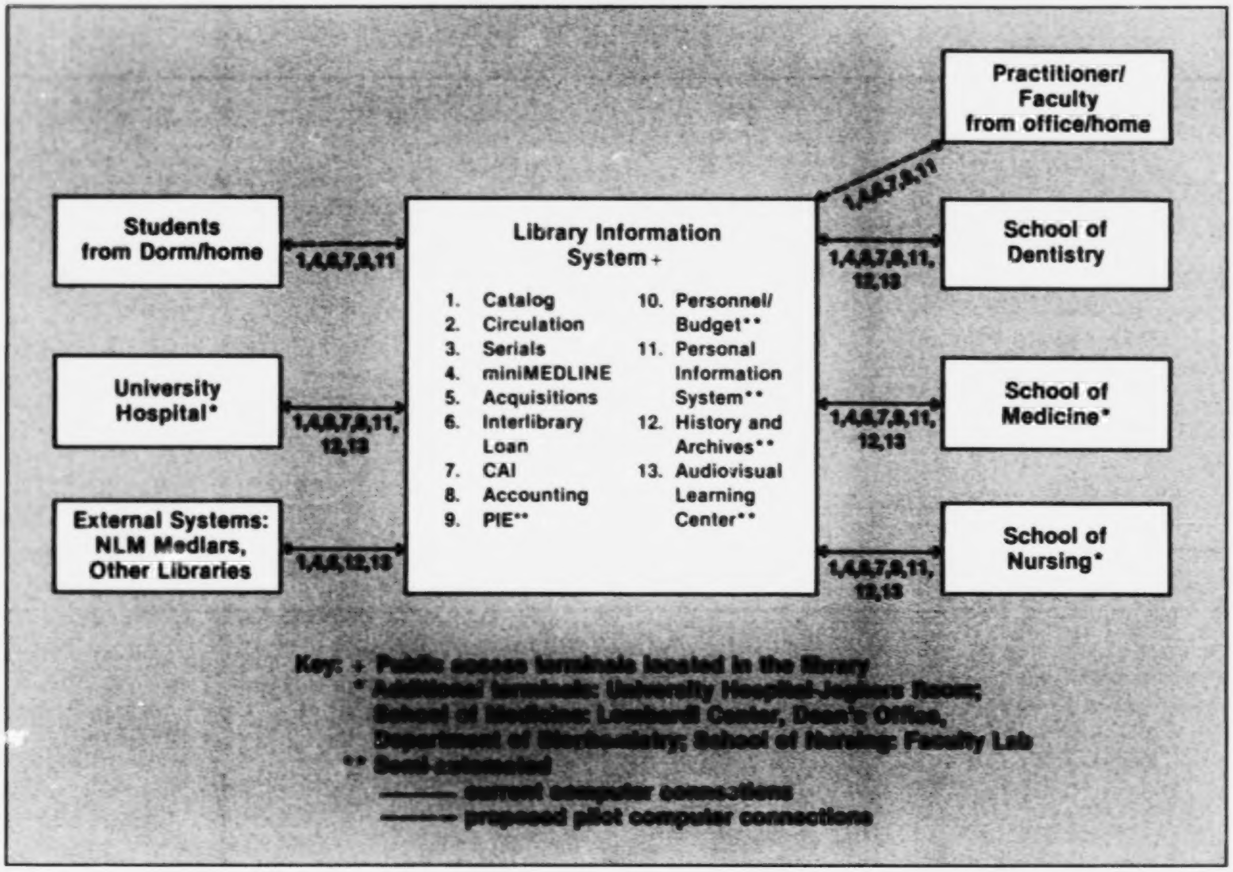

Library
1. LIS
2. DBMS
(e.g. Medusa)
3. W.P. System
5. Admin.
School of Dentistry
1,2,3,4
Chancellor's Office
3,5
1,2,3,4
School of Medicine
4. GTE/Minet
IAIMS NETWORK
1,2,3,4
1,2,3,4
School of Nursing
1,2,3,4
1,2,3,4
University Hospital
Remote PC Based Access (students)
Remote PC Based Access (faculty and practitioners)

FIGURE 21

Dahlgren Memorial Library

Automated Information Systems

Pilot Information Flow


Practitioner/ Faculty from office/home
1,4,6,7,9,11
Students from Dorm/home
1,4,6,7,9,11
Library Information System +
1. Catalog
2. Circulation
3. Serials
4. miniMEDLINE
5. Acquisitions
6. Interlibrary Loan
7. CAI
8. Accounting
9. PIE**
10. Personnel/ Budget**
11. Personal Information System**
12. History and Archives**
13. Audiovisual Learning Center**
School of Dentistry
1,4,6,7,9,11, 12,13
University Hospital*
1,4,6,7,9,11, 12,13
School of Medicine*
1,4,6,7,9,11, 12,13
External Systems: NLM Medlars, Other Libraries
1,4,6,12,13
School of Nursing*
1,4,6,7,9,11, 12,13
Key: + Public access terminals located in the library
* Additional terminals: University Hospital-Jaggers Room; School of Medicine: Lombardi Center, Dean's Office, Department of Biochemistry; School of Nursing: Faculty Lab
** Semi-automated
current computer connections
proposed pilot computer connections

the effectiveness of the Pilot IAIMS tests. User reaction and usage will be via completion and submittal of previously developed forms and, where operationally and economically feasible, via system tools embedded in the IAIMS system.

IAIMS Impact on Medical Center Operations

As identified in the AAMC Report, there are seven specific aspects of the operation of a medical center associated with education, the delivery of health care and research. Figure 23 is the assessment of the impact of IAIMS as envisioned in the early baseline phase of the planning process, at the Pilot Phase, the Interim Phase and the Long-Term Phase.

This figure reflects the implications of IAIMS including at one extreme the real potential impact of information technology systems and services and their utilization, and on the other, the reality of when and how these systems and information sources can be brought to bear on the Medical Center's operations considering economics, current operations, culture and policy considerations.

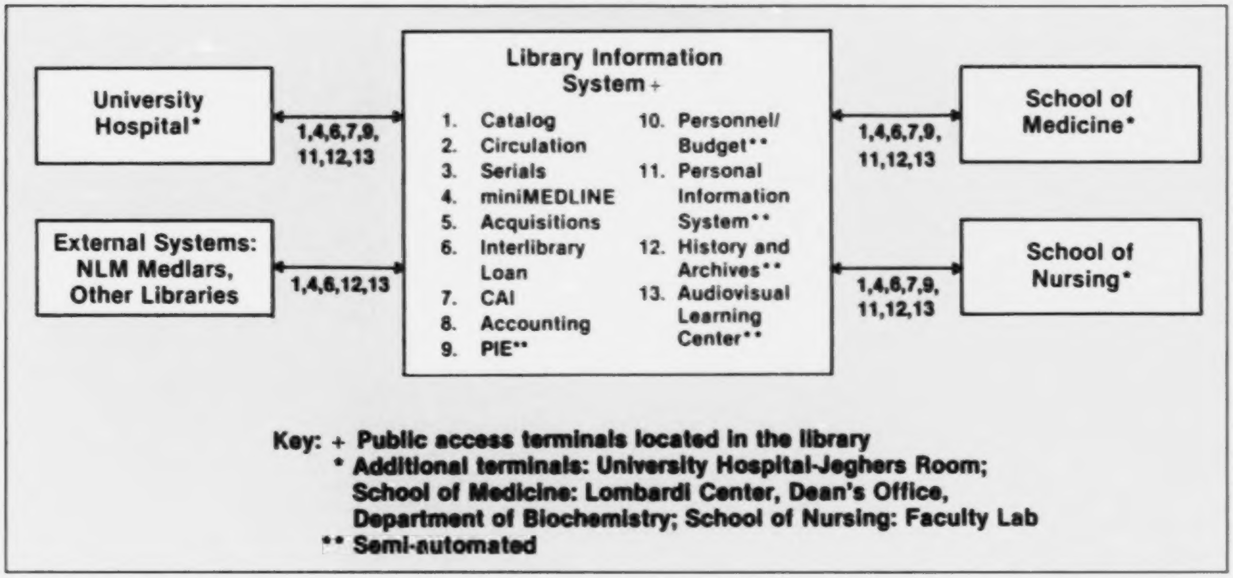
Implementing the Network System

Overall System Architecture Considerations

In considering the various alternatives and establishing the recommended overall architecture for IAIMS, thought was given to a range of components for the IAIMS system to ensure the maximum level of multi-user multi-organizational utilization of information sources. This included the range of access devices (workstations, telephones, video

FIGURE 22

Dahlgren Memorial Library
Automated Information Systems
Current Information Flow


University Hospital*
1,4,6,7,9, 11,12,13
External Systems: NLM Medlars, Other Libraries
1,4,6,12,13
Library Information System +
1. Catalog
2. Circulation
3. Serials
4. miniMEDLINE
5. Acquisitions
6. Interlibrary Loan
7. CAI
8. Accounting
9. PIE**
10. Personnel/ Budget**
11. Personal Information System**
12. History and Archives**
13. Audiovisual Learning Center**
1,4,6,7,9, 11,12,13
School of Medicine*
1,4,6,7,9, 11,12,13
School of Nursing*

Key: + Public access terminals located in the library
*** Additional terminals: University Hospital-Jeghers Room; School of Medicine: Lombardi Center, Dean's Office, Department of Biochemistry; School of Nursing: Faculty Lab**
**** Semi-automated**

cameras, recorders, other office equipment); the range of information sources including formal databases, other forms of written information, people and those information sources associated with operational processes (such as CAT Scan, clinical lab tests, etc.); the processing resources including mainframes, minicomputers, and microcomputers; and the network utilized to connect these various devices.

FIGURE 23

Operational Aspects of Medical Center Operations and the IAIMS Impact

	Pilot	Interim	Long Term
Academic Information Resources and Work Knowledge Base	M	H	H
Research	L	H	H
Medical Education	L	M-H	H
Administrative Information Systems	L	M-H	H
Office Practice	—	M-H	H
Medical Knowledge Bases and Clinical Diagnostic Information Systems	—	M-H	H
Hospital Practice	—	L-M	M-H

Key—L = Low; M = Medium; H = High

The transmission network is considered the most vital backbone element of IAIMS. The primary reason is that effective movement of information is the most critical operational aspect to attaining the IAIMS goal of sharing information more effectively. Secondly, integration of information cannot be achieved without a means of transmitting and collectively gathering data.

A major result, then, of the architectural deliberations is the philosophy that IAIMS should focus on the enabling mechanisms that provide the basis for the most effective cross-utilization of information systems and services in support of the IAIMS goals. The independent units will follow a natural progression, given this enabling capability, to develop their own systems and databases which will then become a part of the overall IAIMS for GUMC.

1. Considerations and Trade-Offs

Based on the conclusion that an important focus of IAIMS is the enabling mechanism and that this capability is the transmission network, detail technical planning is essential. The architectural considerations are driven by an understanding of the applications, equipment, capabilities, environmental and cost considerations that are involved and the longer term GUMC trends for information sources, computer power and end-user requirements. It is important, then, to understand on a general basis the:

- Nature of the traffic to be carried.
- Bandwidth required.
- Geographic dispersion.
- Connectivity required.
- Physical environment.
- Performance needs.
- Projected growth.

2. Distributed Systems

Although the implementation focus is in the network, the considerations involve looking at such areas as processing power and database location. Georgetown's unique requirements call for a distributed system approach.

(A) Information Source/Database Location

There are currently several isolated clinical, informational and research databases at GUMC. The question is, therefore, one of the potential growth of those databases and, the considerations of which databases need to be centralized or decentralized. The primary considerations associated with a highly distributed database are, in the positive sense, that this makes the information sources less vulnerable to system failures or events which jeopardize the viability of a database; there is a higher probability of improved access performance; and in the case of Georgetown, it does support the current organizational and operational philosophy of autonomous operations.

While a highly centralized system may provide economy of scale, the negatives relative to a highly centralized database location are its vulnerability to single point failures; a potentially lower level of performance with the high level of access involved; and the complexity of the system as the size and number of relationships related to the utilization of those databases increase.

(B) Processing Power

Again, the extreme cases of a highly distributed and highly centralized system of computers are compared in relative pros and cons. The negatives of a highly centralized system are the potential problem for performance problems particularly in response time and system down time; but also, a significant problem related to the difficulty to change, tailor or expand a tightly coupled system.

A highly distributed processing power architecture provides the benefits of flexibility for change and expansion since this can be done on a unit by unit or user by user consideration; there are potential cost performance benefits at the user level; and in the case of Georgetown, it more closely supports the current organizational and operational structure.

(C) Information Transport:
Local Area Network and Digital PBX

There are three basic categories of information transport mechanisms available for the on-campus movement of non-voice information—a high bandwidth Local Area Network (LAN), a data PBX and a digital "third or fourth generation" voice/data PBX.

A properly selected LAN can support all of the applications envisioned in the GUMC IAIMS scenarios, but at a cost of approximately $1000 per terminal connection. However, many of the applications could be supported on a low-speed (less that 2400 bps) dial-up basis, resulting in the LAN connection potentially being a high cost overkill.

A data PBX would also be "a $1000 per terminal" connection, but would also be limited to applications up to 56 Kbps. It would not support the higher bandwidth applications; it might not be cost effective for many of the lower speed applications.

A digital voice/data PBX can also support many of the applications with its data switching capability and the relatively high bandwidth capacity of its wiring. If installed at GUMC to support the basic telephone requirements the incremental cost to support the non-voice transmission requirements of IAIMS would be less than the LAN or data PBX alternatives. The pervasive availability of the telephone system and its wiring would minimize growth costs for introduction of non-voice terminals. This PBX, however, is currently limited to the medium bandwidth applications. A LAN would be required for the higher bandwidth requirements as well as for those higher usage (full period connect operations) applications for which it is more feasible operationally and economically to connect the terminals directly to a computer.

The optimum architecture for GUMC, then, is a hybrid system. The digital PBX is highly desirable, but cannot support the range of requirements envisioned for IAIMS. There is, therefore, also a need for a LAN. Its selection and growth requirements must be considered in the context of whether or not there will be a digital voice/data PBX supporting GUMC in the early phases of IAIMS (within the next 2 years). Georgetown University plans to replace its current Bell Telephone Company provided Centrex service with an on-premise Georgetown PBX. The result of that activity will impact the Implementation Plan favorably.

(D) Other Considerations

The other primary considerations in an overall architecture concern the areas of:

- The degree of system compatibility, standardization and inter-operability which could be assumed given the current inventory of systems, autonomy of unit operations and their current plans, etc.
- The degree of commonality of keyboards, terminals and applications software, which could be accepted and enforced.
- The importance of redundancy and disaster planning in a trade-off against independence of managment and operations by the various GUMC units.

3. Network Considerations

With the recognition that the on-campus transmission network is the most important system element of IAIMS, and that an effective integrated utilization of information can be achieved in a highly decentralized database environment, the architecture efforts must focus on the network.

The Development Team reviewed characteristics of transmission networks and their implications to establish the network architecture in the generic sense. In the more specific sense as the implementation of IAIMS proceeds, the following characteristics will be considered in greater detail:

- The physical transmission medium
  twisted wire pair
  coaxial cable
  optical fiber
  space (microwave, infrared, etc)
- The switching method(s) to be utilized
  circuit switching
  packet switching
  message switching
- The method of control of the transmission medium
  trunk or port contention
  frequency division multiplexing
  time division multiplexing
  token passing
  time division multiple access
- The topology of the network
  a star configuration
  ring
  loop
  bus
  a hybrid of more than one of the above

4. Conclusions Concerning the IAIMS Architecture

As a result of the above analysis, the operational and cultural considerations, and the discussion and deliberations preceding and involving architectural atlernatives, the following conclusions were reached about the overall IAIMS architecture:

- The effective movement of information (voice, data, text, image and video), the transmission system, is the most critical component of the overall architecture and, therefore, the most important area of consideration.
- There is currently no single technical alternative which will cost-effectively support the GUMC requirements for IAIMS.
- If a new telephone system is implemented, it should be based upon a customer premises Digital PBX.
- A new GUMC or University Telecommunications System, if a Digital PBX, (with its associated on-campus wiring) can provide a major portion of the non-voice transmission capability required, at a much lower incremental cost than that for the establishment of separate stand-alone networks for the non-voice transmission.
- While there will always be operational or policy bases for having multiple large computers ("super-mini" and mainframes), product trends and economics will dictate continual re-evaluation.
- While there should always be some level of decentralization of information sources (e.g. specialized databases of little general interest; extreme privacy or security concerns; natural integration with a special hospital system such as radiography; etc.), this should also be reviewed where systems or support costs can be reduced and efficiency can be increased.

- There will be standardization to support interoperability among communities of interest at the:

  IAIMS physical interface level
  IAIMS transmission link level
  Personal computer workstation level
  Database management system level

- The consideration of the many diverse factors of operational requirements, security, privacy, cost, improved effectiveness of IAIMS, current status of equipment book value or lease terms, risk associated with migration of operational systems, etc. will be the basis for defining the detailed IAIMS system and its evolutionary implementation plan. Review and approval at key points in this process will be the basis for implementation of IAIMS. The most difficult aspect of this decision process will be the trade-off of operational preference and desire to maintain current autonomies and the opportunities for true cost savings.

5. The IAIMS Architecture: Telecommunications System

The long term architecture of IAIMS is depicted in Figure 24. This architecture will support the long-term scenario defined for IAIMS. It assumes the existence of an on-campus Telecommunications System with digital voice/data PBX but is a hybrid network utilizing a LAN for high bandwidth and high usage pattern connections. A careful choice of the PBX will provide some level of integration with the LAN associated with the high usage pattern connections. It also reflects the availability in the longer term of cost-effective high bandwidth transmission off-campus (nationally and internationally).

In order to establish the phasing of the implementation of this architecture, a profile of usage requirements is shown in Figure 25 which reflects the basis for developing that phasing. This profile has also been used to establish activity, key mile-

FIGURE 24
IAIMS Long Term Architecture

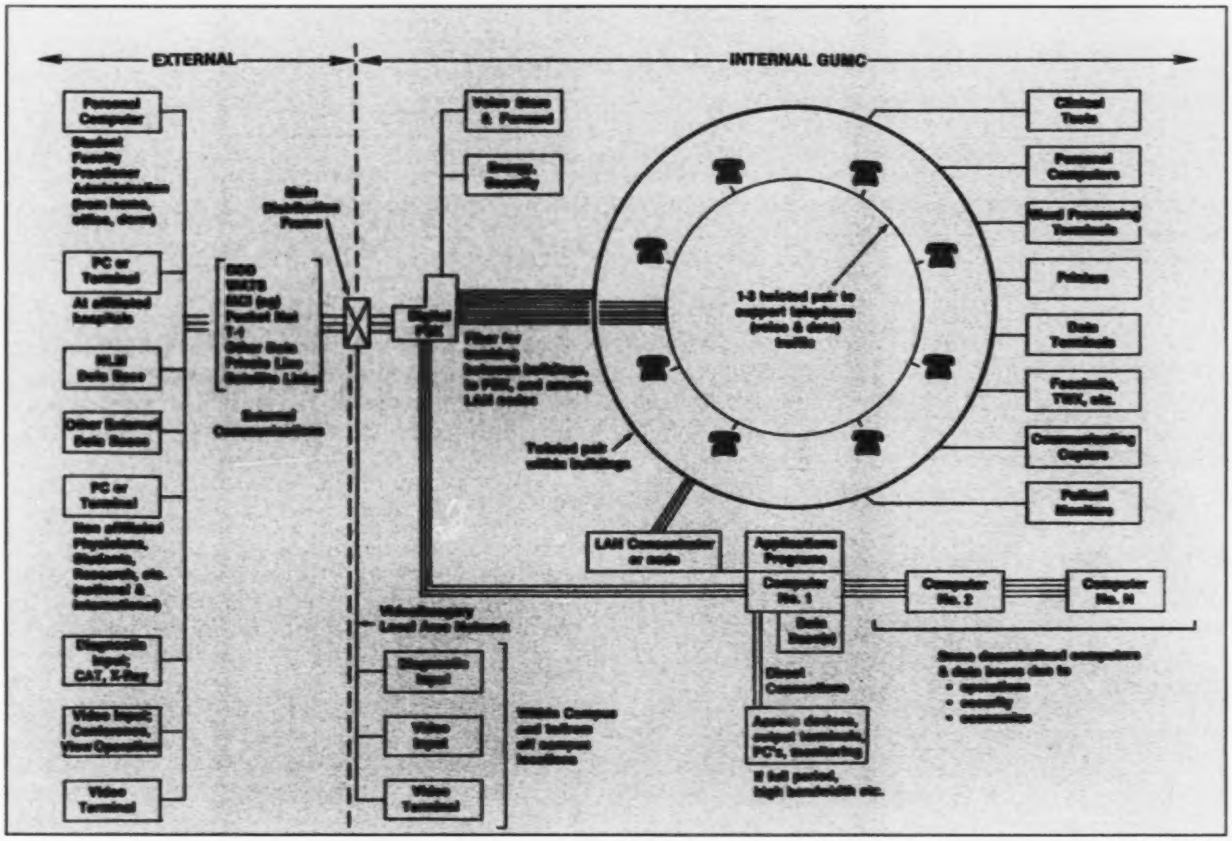

EXTERNAL
INTERNAL GUMC
Personal Computer
Student
Faculty
Practitioner
Administration
(from home, office, dorm)
PC or Terminal
At affiliated hospitals
NLM Data Base
Other External Data Bases
PC or Terminal
Non affiliated Physicians, Students, Research, etc. (national & international)
Diagnostic Input; CAT, X-Ray
Video Input; Conferences, View Operations
Video Terminal
Main Distribution Frame
DDD
WATS
MCI (eg)
Packet Net
T-1
Other Data
Private Line
Satellite Links
External Communications
Voice Store & Forward
Energy, Security
Digital PBX
Fiber for trunking between buildings, to PBX, and among LAN nodes
Twisted pair within buildings
1-3 twisted pair to support telephone (voice & data) traffic
Clinical Tests
Personal Computers
Word Processing Terminals
Printers
Data Terminals
Facsimile, TWX, etc.
Communicating Copiers
Patient Monitors
LAN Concentrator or node
Applications Programs
Computer No. 1
Data Base(s)
Computer No. 2
Computer No. N
Some decentralized computers & data bases due to
• operations
• security
• economics
Direct Connections
Access devices, output terminals, PC's, monitoring
If full period, high bandwidth etc.
Video/Imagery Local Area Network
Diagnostic Input
Video Input
Video Terminal
Within Campus and to/from off campus locations

FIGURE 25

IAIMS—Usage Requirements

Implementation Scenario

(End of Year Status)

	Year 1	Year 3	Year 5	Year 7
Workstations (W/S) Accessing IAIMS	50-100	1000	4000	?
W/S on direct or non-IAIMS LAN connection	600	400	200	100
Off Campus access	Very limited	Opened up; GUMC only	Maximum 1500-2000 GUMC related	?
Non-GUMC access	NO	NO	May be pilot test	Open national & international
High bandwidth video/imagery	NO	Very limited point to point on campus	Pervasive on-campus; pilot off-campus; All GUMC	National & international include non-GUMC
Computer Power	Approx. 30 mainframes/minis; 1 in IAIMS	5-8 mainframe/mini in IAIMS. Unknown # not in IAIMS.	75-80% with IAIMS 20-25% non-IAIMS	?
Information Sources & Applications	4-6 databases; 2-3 applications (Pilot)		40-60 databases online; 10-20 applications	

stone and resource aspects of the IAIMS implementation plan.

Based upon this profile, the architectures for the Pilot and Interim IAIMS phases were developed and are shown respectively in Figures 26 and 27.

6. Other Related Enabling Mechanisms

In addition to the previously discussed transmission network, the other enabling mechanisms identified and included in the implementation plan are:

- The establishment of a database "architecture" to simplify usage and minimize redundant data.
- Development of a directory of IAIMS information sources to provide visibility of what is available, and specifics on accessibility, usage and control of the information.
- Development, implementation and management of acceptable mechanisms for access and control of those databases.
- Establishment and maintenance of some level of inter-operability standards.
- The establishment of an effective training and support function (the AIMC).
- A preferred "machine-independent" operating system which would allow some variety of computers and access devices to operate an IAIMS.

Summary of Network

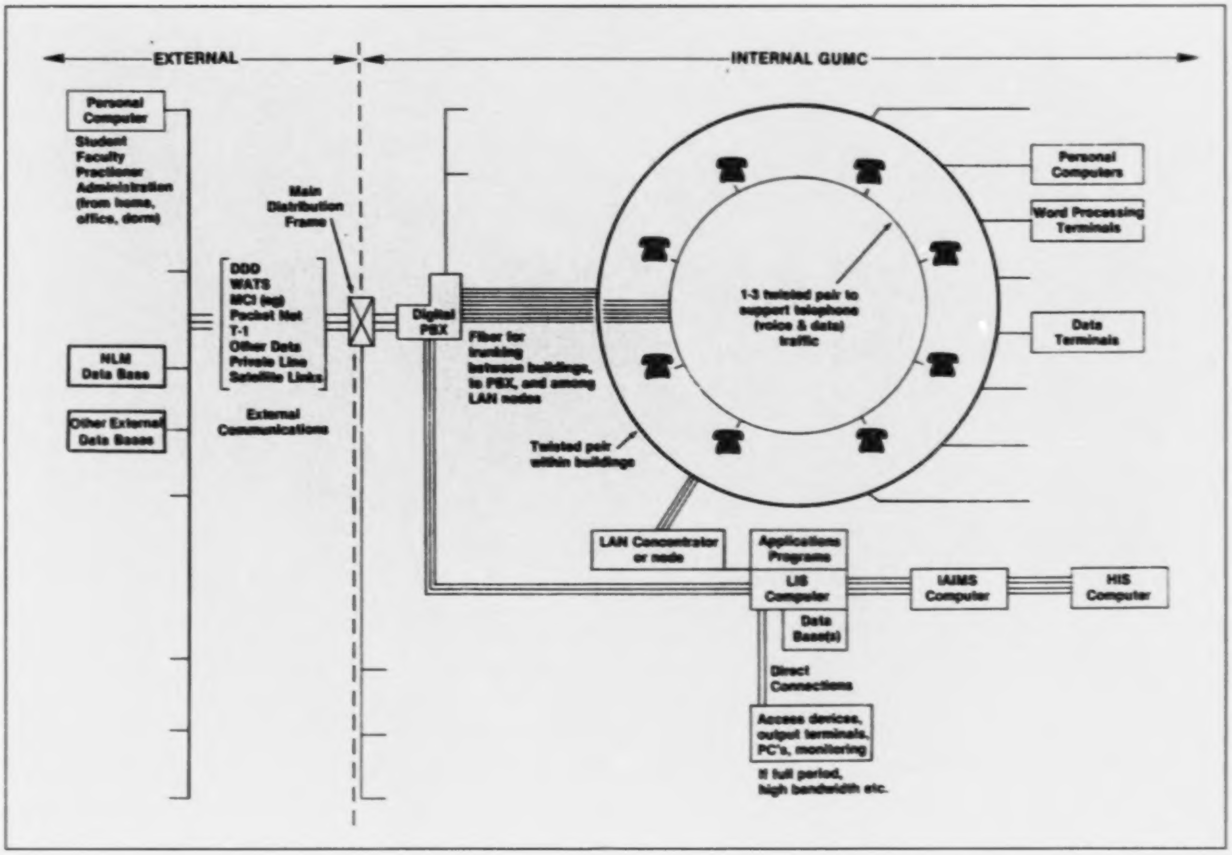
The focus of the implementation plan is on achieving the Interim IAIMS within five years. The primary information use scenarios for the Interim IAIMS are summarized in Figure 28.

1. Profile of Network Usage Requirements

The profile of usage requirements included previously in Figure 25, was established as a basis for identifying activities, milestones, and resource requirements. The information in that chart reflects:

FIGURE 26

Pilot IAIMS Architecture


EXTERNAL
INTERNAL GUMC
Personal Computer
Student
Faculty
Practioner
Administration
(from home,
office, dorm)
NLM Data Base
Other External Data Bases
Main Distribution Frame
DDD
WATS
MCI (eg)
Packet Net
T-1
Other Data
Private Line
Satellite Links
External Communications
Digital PBX
Fiber for trunking between buildings, to PBX, and among LAN nodes
Twisted pair within buildings
1-3 twisted pair to support telephone (voice & data) traffic
Personal Computers
Word Processing Terminals
Data Terminals
LAN Concentrator or node
Applications Programs
LIS Computer
Data Base(s)
IAIMS Computer
HIS Computer
Direct Connections
Access devices, output terminals, PC's, monitoring
If full period, high bandwidth etc.

- The 4000 workstations accessing IAIMS in Year Five (1989) is based upon an 80% penetration of 2500-3000 health care/education professional and clerical personnel: 1500-2000 students; 500-800 practitioners.

- The 600 workstations initially on a hard wire or non-IAIMS LAN connection at the start of IAIMS grows to 800, but 50% migrate to utilization of PBX and telephone wiring or the IAIMS LAN.

- Off-campus access is very limited in Year One due to capacity limitations of the Centrex telephone service.

- In Year Five, 80% of the practitioners and students will want access from home, office or affiliated hospitals.

- The off-campus access by non-GUMC individuals or institutions cannot be estimated.

2. Schedule and Activities of the Network System: Telecommunications

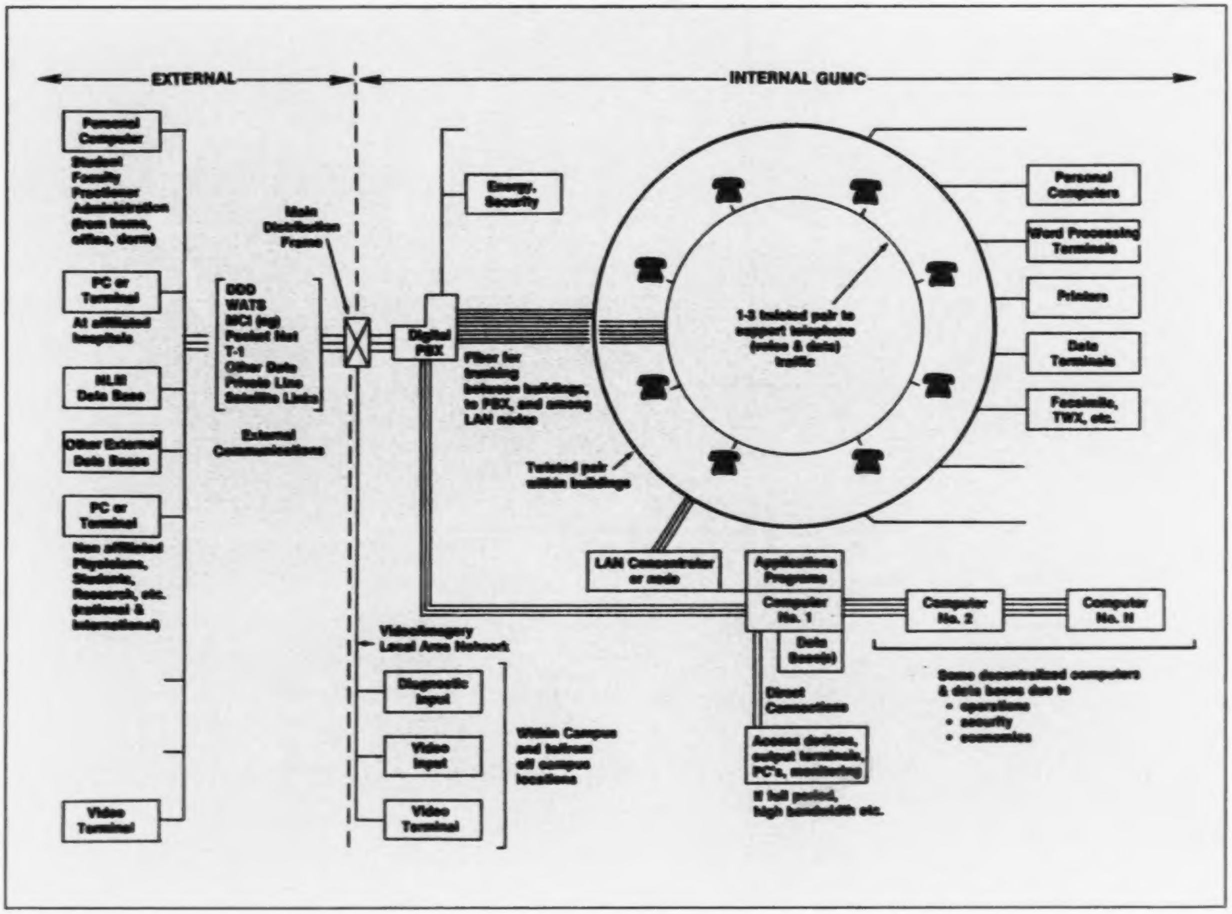
An overall five year schedule for IAIMS is shown in Figure 29. It shows the relationship of Pilot and Implementation programs (users, systems, information sources and applications) to the schedule for the transport mechanism (network system) procurements. It provides the basis for establishing specific quarterly activities, milestones and resource requirements. The "Interim IAIMS" is hereafter designated as the "Full IAIMS" Program.

Key Assumptions

The key assumptions associated with this schedule are:

- NLM or other external funding will be available for the Pilot program in July/August, 1985; this will be key to the timing of major external con-

FIGURE 27
Interim IAIMS Architecture


EXTERNAL
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Non affiliated Physicians, Students, Research, etc. (national & international)
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DDD
WATS
MCI (eg)
Packet Net
T-1
Other Data
Private Line
Satellite Links
External Communications
Main Distribution Frame
Digital PBX
Energy, Security
Fiber for trunking between buildings, to PBX, and among LAN nodes
Twisted pair within buildings
1-3 twisted pair to support telephone (voice & data) traffic
Personal Computers
Word Processing Terminals
Printers
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Facsimile, TWX, etc.
LAN Concentrator or node
Applications Programs
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Computer No. 2
Computer No. N
Some decentralized computers & data bases due to
• operations
• security
• economics
Direct Connections
Access devices, output terminals, PC's, monitoring
If full period, high bandwidth etc.
Video/Imagery Local Area Network
Diagnostic Input
Video Input
Video Terminal
Within Campus and to/from off campus locations

tractural commitments for the initial Pilot program.

- NLM (or other external) funding to begin "Full IAIMS" implementations will be available no earlier than April, 1986 but no later than October, 1986; start of external commitments will be at the midpoint—July, 1986.
- Organization and processes are established on a timely basis.
- Hospital participation is implemented in 1986/1987 allowing:

  an opportunity to observe effectiveness of control and access processes and procedures systems, applications and users are introduced via Pilot program(s)
- There is a transport mechanism available early, involving a Local Area Network

  Centrex cannot support a meaningful Pilot (would be dial-in supported only)

  The AT&T ISN is used as a model for planning and cost estimating; this does not prejudge the Pilot or long term LAN
- The Pilot does not have a finite life; all new applications and/or user sets will be introduced via a Pilot; the Pilot concept is a continuum (per the Baseline).
- A decision to implement Pilot programs to operational and expanded usage can be made after 9-12 months to provide sufficient time for pilot operations, evaluation and GUMC decision processes.
- The Pilot for video/imagery is implemented in late 1988.
- While the AIMC function will be "bootstrapped" in the early Pilot programs (and located in the

FIGURE 28

IAIMS—Key Assumptions

Primary Information Use Scenarios for Interim IAIMS

Education via problem solving
- student specific computer assisted learning packages
- integration with research information, library information, "protected" patient information vs. diagnoses and treatments, analytical models
- feedback to faculty
- student access from dormitory, home, etc.

Practitioner access to patient status from home or other off-campus location
- provide instructions to resident
- change treatments/drugs/etc.
- validate receipt of correct instructions
- feedback on actions taken

Demographic analyses of patient information available within strict controls for
- diagnosis and consultation
- planning and measurement of health costs
- student problem solving

Beginning use of video for basic education, continuing education, diagnostics and general health care delivery
- viewing of X-ray, CAT, etc.
- seminars and classes
- teleconferencing for diagnosis, planning, etc.
- remote viewing of students in clinical situations

- While the AIMC function will be "bootstrapped" in the early Pilot programs (and located in the Library), an operational AIMC is required by early 1987 to support expanded Pilot activities and the start of Full IAIMS operations.
- Activity time lines and key milestones reflect neither an expedited effort nor a protracted one.
- LAN usage by the School of Nursing is tied to introduction of the second node at the Hospital, this in turn is gated by availability of the larger level of external funding; earlier participation will be via dial-up.

Schedule for Implementing the Network System: Telecommunications

A logical step by step process will be followed to implement the network system. While activities will be coordinated with installation of the campus-wide Telecommunications System, the Medical Center will move forward to meet its immediate needs for the Pilot IAIMS through a LAN. An AT&T Telecommunications System including digital PBX, System 85, fiber optics and ISNs is planned (see below). The Medical Center plans to achieve compatibility with that system by installing a LAN in the Fall of 1985 to meet the needs of the Pilot projects. The LAN will interface with the campus Digital PBX system.

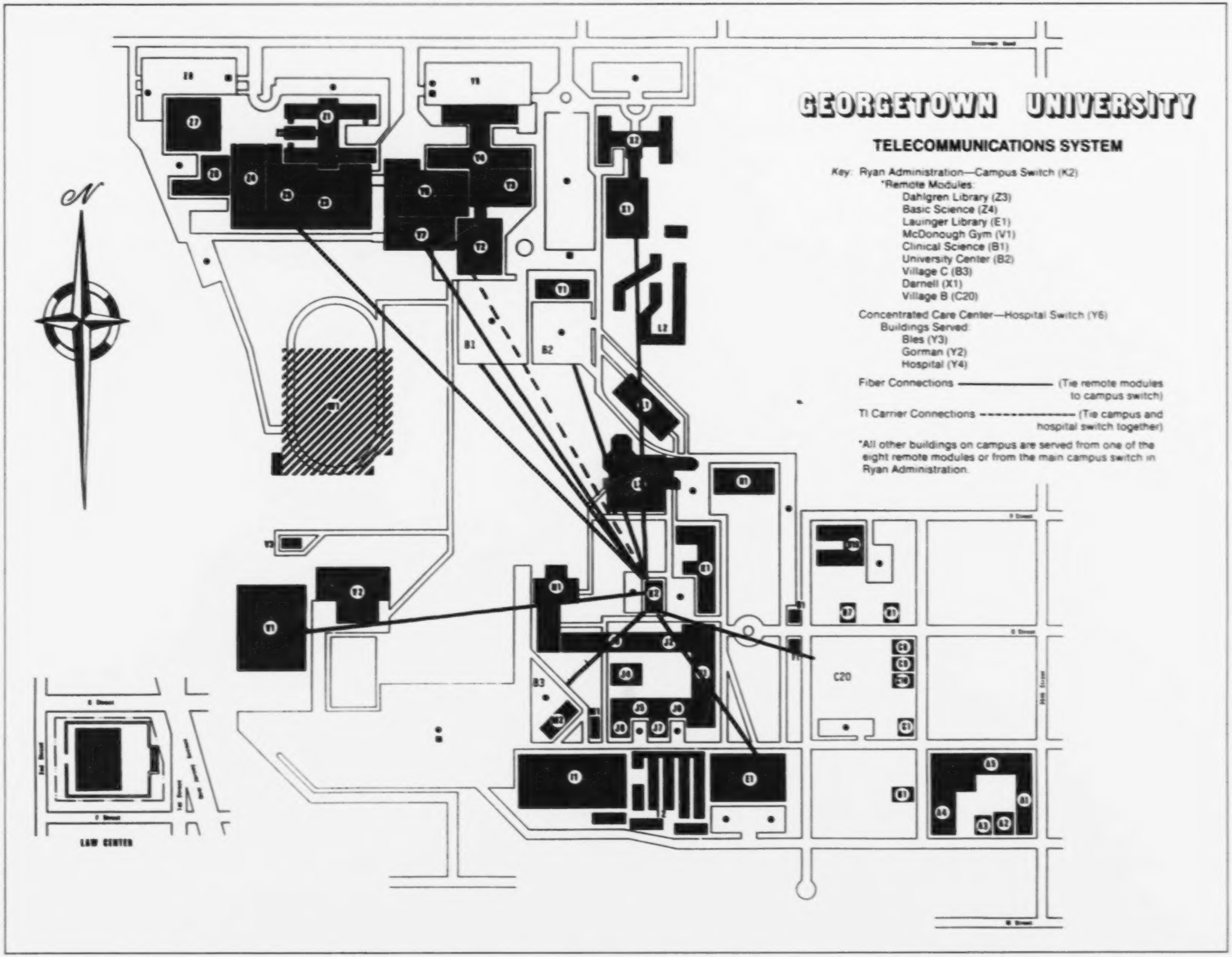
A schedule of activities is included in the technical network system milestones under Section IX of this report.

Progress of the Campus Telecommunications System

Georgetown University currently is involved with the campus-wide implementation of a new digital telecommunications system to be provided by AT&T Information Systems. The initial system will connect approximately 8000 users located in over 50 campus buildings via the AT&T-IS System 85 PBX.

The new PBX will consist of a central computer connected via fiber optic cable to remote modules located throughout the campus. These remote modules will then connect to both voice and data terminals via standard twisted pair cable. This new system is expected to be cutover during the summer of 1986. The inherent voice and data capabilities of the System 85 PBX will upgrade immediately data transfer in the GUMC as well as the entire campus. The fiber optic network which connects the new system also positions the University to provide advanced capabilities—such as video transmission—as they are required.

The Medical Center plans to enhance the System 85 implementation through the expected installation of a Local Area Network.This network will provide high speed data transmission within the Medical Center, and through the System 85 connection, also provide enhanced connectivity to the entire campus.



GEORGETOWN UNIVERSITY

TELECOMMUNICATIONS SYSTEM

Key: Ryan Administration—Campus Switch (K2)
  *Remote Modules:
    Dahlgren Library (Z3)
    Basic Science (Z4)
    Lauinger Library (E1)
    McDonough Gym (V1)
    Clinical Science (B1)
    University Center (B2)
    Village C (B3)
    Darnell (X1)
    Village B (C20)

Concentrated Care Center—Hospital Switch (Y6)
  Buildings Served:
    Bles (Y3)
    Gorman (Y2)
    Hospital (Y4)

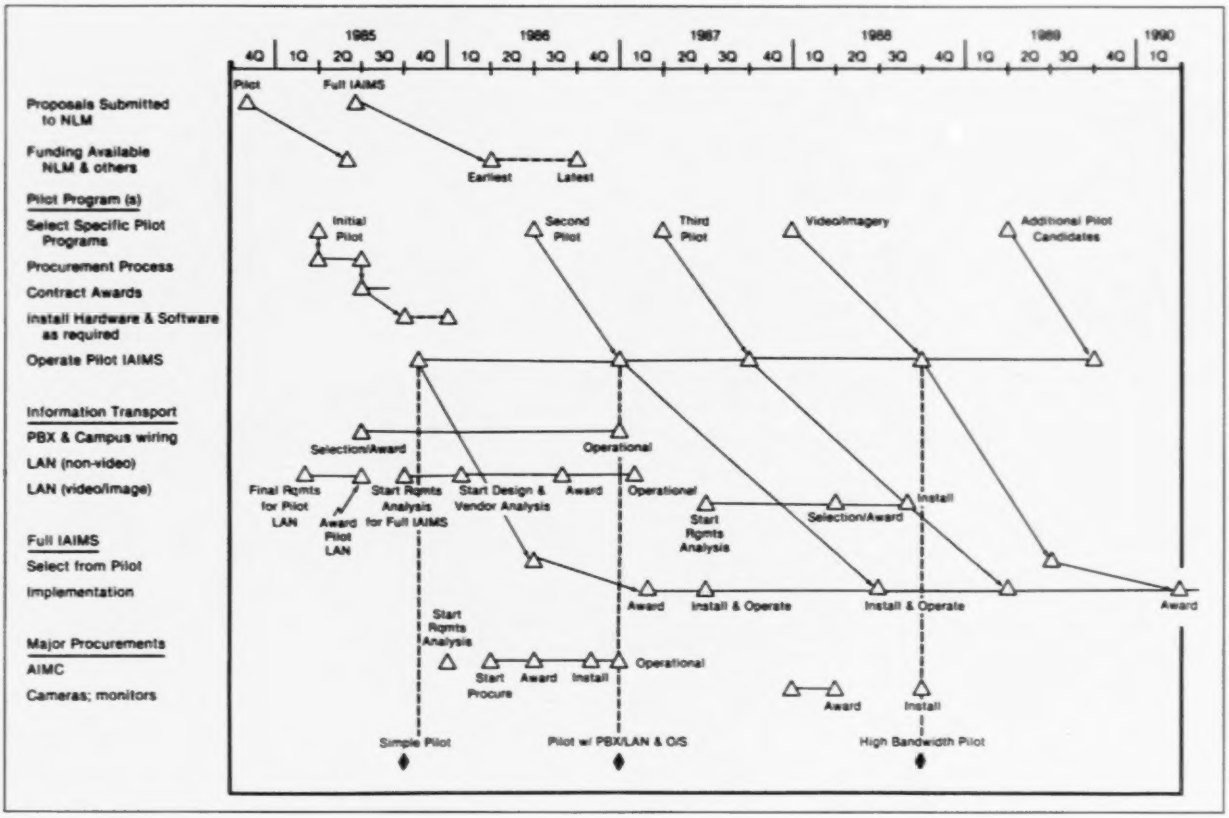
Fiber Connections ———————— (Tie remote modules to campus switch)

TI Carrier Connections - - - - - - - - - - (Tie campus and hospital switch together)

*All other buildings on campus are served from one of the eight remote modules or from the main campus switch in Ryan Administration.

FIGURE 29

Overall Schedule—IAIMS Implementation



The campus-wide installation of System 85 is an important first step towards the total integration of an "electronic campus." The Medical Center through the IAIMS effort expects to lead the campus through its support of the system as well as its own implementation of a separate, yet compatible and integrated, data network.

Resource Requirements for IAIMS Implementation

The IAIMS program will require funding of approximately $25.5 million for ten years including $9.5 M through mid 1989 (five years), $8 M for the final five years, and $8 M for expansion of the Library facility. This does not include the additional $10 M required for a Telecommunications System. The IAIMS funding, summarized in Figure 30, is required for those personnel and system costs associated with detailed planning, implementation and operations associated with the "enabling mechanisms" portion of IAIMS.

Key Assumptions for Resource Requirements

The resource estimates identified in this section were developed based on the following assumptions:

- The implementation resources are limited to the following:

  The transmission network necessary to support the initial Pilot and Full IAIMS.

  The staffing to develop and manage the transmission network.

  The staffing to develop, implement and maintain the other enabling mechanisms (e.g. the AIMC; IAIMS requirements and implementation coordination; and GUMC Coordination for IAIMS).

  Computer hardware and software systems for the Initial Pilot only.

FIGURE 30
Resource Requirements

	1984	1985	1986	1987	1988	1989	5 Year Total
Transmission Network	—	$80-90K	$240-260K	$550-680K[3]	$400-450K	$400-450K	$1670-2050K
Equipment	—	$200-300K	$150-240K	$100-140K	$95-100K	$100-120K	$645-900K
Software & Services[1]	—	$25-40K	$25-40K	$25-40K	$25-40K	$25-40K	$125-200K
Staffing	$15-20K[4]	$400-640K	$880-1120K	$1120-1440K	$1120-1440K	$1280-1600K	$4815-6260K
AIMC Equipment & Operations	—	—	$25-40K	$60-80K	$100-120K	$140-160K	$325-400K
Special Equipment	—	—	—	—	$200-250K	$200-250K	$400-500K
Contingency	$5K	$10-30K	$40-50K	$65-100K	$100-120K	$55-120K	$315-320K
Annual Total	$20-25K	$705-1070K	$1320-1700K	$1920-2600K	$2040-2520K	$2240-2720K	$8275-10715K
Cumulative[2]	$25K	$912K	$2422K	$4700K	$7000K	$9500K	$9500K

1. On rental/expense basis
2. Use mid point.
3. Amount of trenching required is great impact.
4. Fourth Quarter 1984 requirements only.

Other special equipment such as video and imagery equipment.

- The implementation resources not included in the resource estimates are as follows:

  Terminals connected to or accessing the IAIMS network.

  Other equipment, support and staffing which would be required in a non-IAIMS network environment.

  The equipment, support and staffing added to the "natural evolution" due to expanded plans to capitalize upon the IAIMS enabling mechanisms.

  The overhead staffing associated with GUMC coordination and decision making processes.

- The Academic Information Management Center (AIMC) function will be bootstrapped through the Initial Pilot effort with a minimum staffing in the Library function. Resources for the Full IAIMS include equipment and support, fit-up of facilities, ongoing space cost and staffing.

- Transmission Network Costs are based on AT&T Information Systems Network (ISN) technology and Local Area Network equipment. Dial-up users will access the IAIMS transmission system initially, via the GUMC Centrex System and, at a future date, via the GUMC PBX System. Costs estimates for the transmission system components and for the Initial Pilot data processing hardware and software are specified in Figure 31.

- Staffing includes overhead and utilizes a $80,000 per person per year on average.

Volume Drivers and Costs Estimates

Figure 32 identifies the key volume drivers utilized in sizing the Local Area Network for IAIMS. Costs for that Network (the AT&T ISN was used as a model for costing), are included in Figure 31.

The distribution of terminals and building locations is for cost sizing only. The actual distribution and location of the 50 LAN connected terminals will be determined during the detailed planning of the Pilot program. Likewise, the number and location of terminals in later years is not prejudged here.

Human Resources—Staffing Assumptions

Figure 33 details the staffing assumed for IAIMS implementation and operation through 1989. This is the basis for the staffing costs included in Figure 30.

A. Staff with Technical Capabilities

B. Staff to be Recruited

Resources to Operate the Academic Information Management Center (AIMC)

The AIMC function will be established. Its specific configuration and organizational location are currently under consideration. For the Initial Pilot, this function will be performed as a minimum augmentation of the Library and the audio/visual unit. Ultimately, this activity requires expansion of the Library facility.

The resource requirements included in Figure 30 as AIMC equipment and operations are for equipment and support; fit-up of facilities; and ongoing cost of space. AIMC staffing is included in the overall staffing estimates.

AIMC equipment, space and personnel are estimated on the basis of:

- One trainer per 400-600 IAIMS users.
- Four AIMC terminals per 400-600 users.
- 500 square feet of space per 400-600 users.

Comments and Summary

The following comments are in order relative to the resource requirements as identified in this section:

- The distribution of terminals does not prejudge the final GUMC decisions; a reallocation within the assumed number is covered in the estimated resources; a different number would change that estimate.
- The resource requirements reflect a usage of only the Local Area Network as the transmission medium; the introduction and utilization of a digital PBX and its wiring would reduce that portion of the estimated resouces.

FIGURE 31

IAIMS Transmission & Initial IAIMS Cost Estimates ($000)

	1985	1986	1987	1988	1989
Local Area Network					
• Hardware Installed (ATTIS)	71	183	411	315	315
• Wiring Installed					
Twisted Pair to Term (@ $150)	7.5	52.5	90	75	75
Fiber (SW-SW; SW-CONC)	6	12	72*	0	0
$6/ft. (Non-trenching) $12/ft. (Trenching)	(1000′-2 Bldgs.) (no trenching)	(2000′ to 2 more Bldgs.) (no trenching)	(6000′ to 2 more Bldgs.) (no trenching)		
Centrex/PBX Lines					
• Installation (@ $200/line)	1.6	2.4	6	5	5
• Service (@ $20/mo/line)	1 (½ year)	3.5	8.5	15	21
Total by Year	87.1	253.4	587.5	410	416
Cost Range	$80-90K	$240-260K	$550-800K	$400-450K	$400-450K
DP Hardware & Software (Initial Pilot)					
• Hosts (@ $150,000-200,000)	200-300	150-240	100-140	95-100	100-120
Cum Host Costs	200-300	350-540	450-680	545-780	645-900
• System Software @ 3-5% of Host Cum Costs	5-10	5-10	5-10	5-10	5-10
• Applications Software @ 3-5% of Host Cum Costs	5-10	5-10	5-10	5-10	5-10
• Maintenance/Supplies @ 10% of Host Cum Costs	15-20	15-20	15-20	15-20	15-20
• Subtotal	220-340	175-286	125-180	120-140	125-180

*Amount of trenching required will have a great impact.

FIGURE 32

Volume Drivers for Resource Requirements

	1985	1986	1987	1988	1989
Terminals (Yr. End)					
• Direct LAN Connected	50	400	1000	1500	2000
• Dial in access	160	400	1000	1500	2000
Hosts on LAN	11/44 (LIB) +1 New	+2 New	+2 New	+2 New	+2 New
Bldgs. on LAN (Fiber Interconnected)	2 Library Pre-Clinical Science	+2 Medical Dental	+2 Hospital Nursing	+0	+0
Terminals/Bldg. on LAN (Yr. End)					
• Library	25	40	250	310	480
• Pre-Clinical Science & Med/Dent	25	130	260	300	300
• Dental Clinic	1	40	140	200	240
• Hospital/Lombardi/Clinical Sci.	15	40	320	550	800
• Nursing	3	10	30	50	80
• Basic Science & Neurosciences	1	30	40	50	50
• Kober Cogan	1	20	30	40	50
LAN Switching Centers (ISN Nodes)					
Total Yr. End	1 (Library)	1	2 Library Hospital	2	2
LAN Term Conc. (ISN Conc.)					
Total Yr. End	1	6	18	30	42
Modems for Dial Access					
Total Yr. End @ 20 Term/Modem	8	20	50	75	100
Centrex/PBX Business Lines					
Total Yr. End	8	20	50	75	100

- Staffing does not prejudge the establishment of a single organization nor its organizational attachment(s). It is based on general technical staff expansion required to accomplish IAIMS.
- There is the intent to reflect only "dedicated" personnel in the staffing estimates which account for a significant portion of the IAIMS resources. There may be some overlap with staffing in the separate GUMC units.
- The overall schedule is gated by availability of external funding and timely establishment of GUMC organization, process and implementation.
- Total funding through 1989 (five years) is estimated at $10 million. This is for the enabling mechanisms only and does not include Data Processing/Office Systems equipment, software and support beyond the Pilot. And does not include major building construction or fit-up and a Telecommunications System.
- The utilization of a digital PBX and its wiring as the Local Area Network can reduce the funding requirement by $350K to $650K.

Funding Sources for IAIMS Implementation

The Georgetown University Medical Center has been in a period of growth and development for the last ten years. The inauguration of new programs, increased research and clinical activities, and the extensive expansion of new and improved facilities have gained national attention and have made the Medical Center increasingly competitive for more outstanding faculty and better students.

In all of this tremendous development the funding of these projects has been a major concern, and Georgetown has had to depend heavily upon assis-

FIGURE 33
Staffing Assumptions

	1985	1986	1987	1988	1989
Network Management	1	1	2	2	3
IAIMS Requirements,[1] Implementation and Coordination	3-5	8-10	8-10	6-8	6-8
GUMC Central Coordination	1	1	1	1	1
AIMC Staffing	0-1	1-2	3-5	5-7	6-8
TOTAL	5-8	11-14	14-18	14-18	16-20

[1] Activity sensitive through 1987; volume sensitive thereafter.

tance from its alumni, the Federal Government, established community ties and friends for support. Historically, it has been the careful planning and hard work of administrators and faculty that has resulted in the resources that have advanced this institution.

As previously noted, Georgetown is committed to IAIMS. The immense costs associated with this program will challenge Georgetown's best efforts in thinking and planning and will continue to be a major concern. Nevertheless, identifying the necessary resources that will make it possible for Georgetown to implement a program of this scope are part of the strategic plan. Georgetown expects to fund IAIMS through a variety of sources described below and has been working during the planning process to organize this approach.

FEDERAL AGENCIES	**To begin the program Georgetown will expect to prepare funding proposals to such agencies as NIH, NSF, and NLM for seed funds to launch pilot programs, and for partial core support during the implementation phases of IAIMS. Success in acquiring federal grants will also assist Georgetown immensely in securing support from the private sector.**
INDUSTRY	**Georgetown has already begun to make inquiry to several computer and communications corporations regarding the IAIMS program. It is expected that in addition to any real dollars that might emanate from these sources, the "in-kind" resources that can be contributed from these institutions will be invaluable to the project, not only in terms of actual technology, but also in the important area of establishing institutional networks in this whole field. Some in-kind contributions have already been donated by a major firm and an extended donation program is anticipated through a partnering relationship.**
FOUNDATIONS	**The University Development Office has already launched an awareness campaign of this project. The Chancellor's Office has begun to take steps to seek support from Foundations. Grant applications will be submitted.**
REVENUE	**Georgetown envisions the development and marketing of revenue producing products from its information management center. Revenues are not anticipated in the initial years of the program. Nevertheless, products and services to be marketed so the IAIMS programs can become self sustaining are as follows:**

1. **Databases**
2. **Institutional Programs**
3. **Innovative Software Programs that Georgetown will develop to enhance the networking and/or interface of systems**
4. **Full Text Searching—as publishing on demand becomes more prominent, services from Georgetown's information management center would be offered on a fee basis**
5. **Dial-up access to the Georgetown databases**
6. **Consulting Services on Integrated Systems.**

COST SHARING

Georgetown is committed to the development of IAIMS. Cost sharing is anticipated in all phases of the project, especially in terms of staff and faculty time, supplies, computer time and communications time. During the 20 months of planning, the individuals involved have gained an invaluable amount of knowledge and expertise which represents a considerable investment on the part of the University. Plans are to continue staff development and to get a return on investment from these individuals by keeping them involved in the IAIMS implementation.

With the concept of a multi-year project in mind, so as not to limit ourselves to only the options that are currently apparent, Georgetown will maintain a flexible attitude regarding the development of resources for the IAIMS and will continue to explore other innovative sources of revenue that are certain to avail themselves in the future.

Major IAIMS funding will probably not be available until the second quarter of 1986; some level of external funding to launch IAIMS will be available in mid 1985; GUMC will fund some level of effort to begin the work required for pilot implementation in mid 1985.

There are research opportunities emerging from IAIMS that offer possibilities for special research grants. Georgetown University submitted an IAIMS related research grant application to the NLM that is consistent with the Implementation Plan. Other similar research endeavors and partnerships with the private sector and other Federal agencies will be sought.

The GUMC units will also upgrade their data processing hardware and software, access devices, and the associated personnel over the ten year period. Progress here depends on the units' ability to support automation.

This will be a "natural course" of development. It will probably grow faster than previously planned once the enabling mechanisms of IAIMS are in place.

The administration at Georgetown is convinced that resources can be acquired based on an increasing awareness by funding institutions of the new developments and rapidity of change in telecommunications education. Many corporations are now investing in systems being developed by universities, small companies and individuals. Georgetown plans to explore such ventures. Naturally, the pace at which Georgetown can progress is dependent largely on the ability to attract funding. The plan includes flexibility and even options for a scaled down IAIMS if necessary.

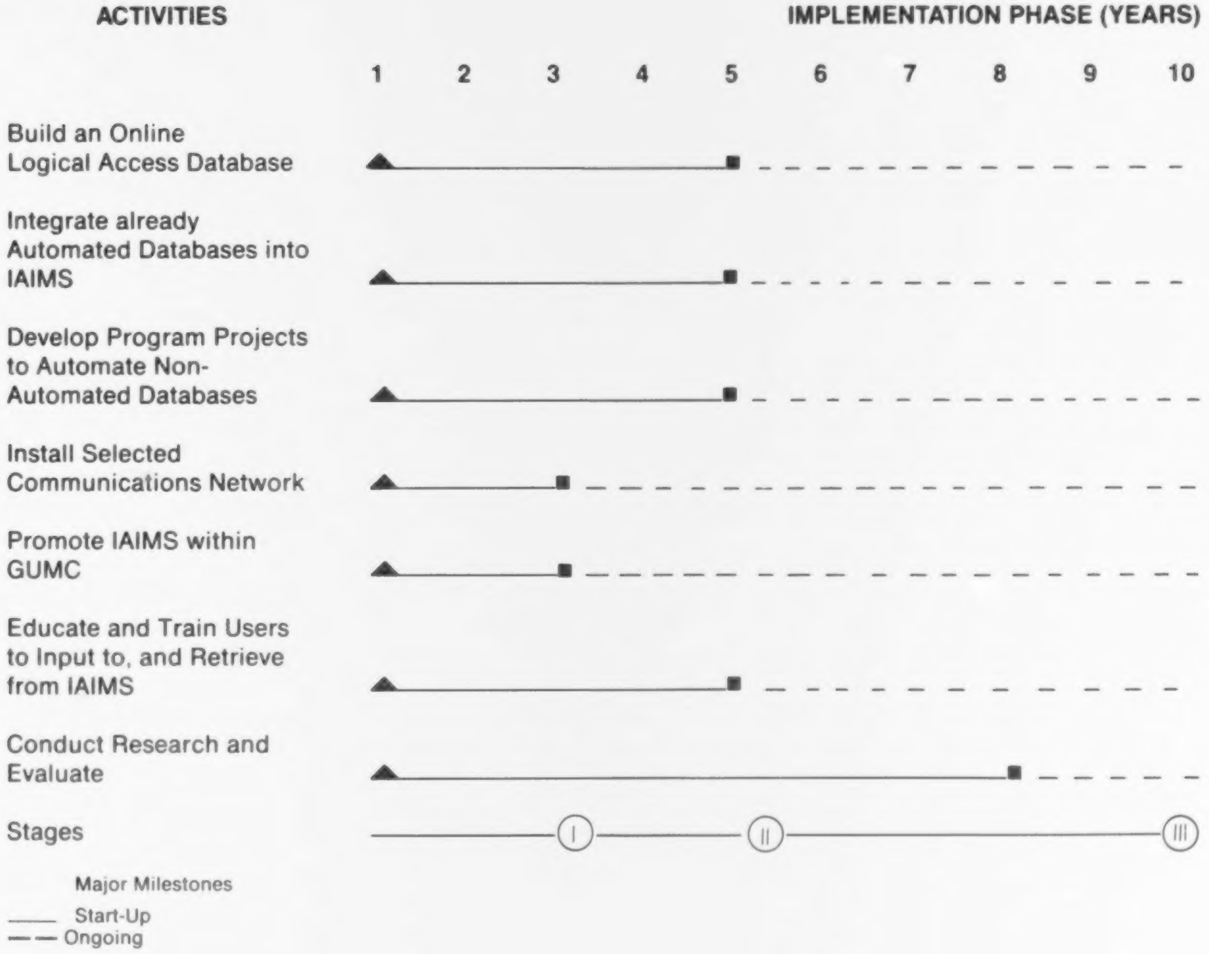
Overall Timetable for Implementing the IAIMS Programs and Network System

Highlighted in this section are the tasks and milestones required to implement the IAIMS network covering programs identified for the Initial Pilot through the Full IAIMS phase. The intent is to move Georgetown gradually from Stage I to Stage III of Technological Development over a ten year period.

A number of distinct activities will be conducted in parallel as indicated in Figure 34 and as outlined in the phased approach. The activities will be conducted at different rates of speed by the various units of the Medical Center. This will enable some units to move ahead without being held back by those other units which are slower to adapt to new information management techniques. Each group can move at its own pace without feeling pressure

FIGURE 34

Timetable for IAIMS



to catch up immediately, yet all will be moving toward the same common goal—a fully implemented IAIMS.

The major activities anticipated include:

- Build an online logical access database.
- Integrate already automated databases into IAIMS.
- Develop program projects to automate non-automated databases.
- Select and install the Communications System.
- Promote IAIMS within GUMC.
- Educate and train users to input and retrieve information through IAIMS.
- Conduct research and evaluation.

The nature of these activities fall under two categories: (1) Academic Programs and, (2) Network System Projects. Features of the Academic Programs involve information flow and subject content requiring coordination and a continuous academic effort from faculty and staff of the Medical Center units and departments. The Network System includes technical aspects such as designing, acquiring, implementing and operating an effective transmission system that enables the flow of biomedical information. This involves state-of-the-art technology including fourth generation computers, decision support systems and advanced communications systems maintained by highly talented and knowledgeable staff.

As mentioned throughout this report, the ten year period of Technological Development and Implementation of IAIMS will be achieved in three phases: Pilot IAIMS (1 to 3 years), Interim IAIMS (3 to 5 years) and Long Range IAIMS (5 to 10 years). These phases represent milestones of development, growth and maturity of IAIMS. The year by year schedule listed below, however, represents a tangible working calendar for putting the system in place within the general phases envisioned for IAIMS. The yearly activities also clearly define objectives to be accomplished and enable measurement and evaluation of the achievements.

The schedule for program implementation has been coordinated with available technology in a sequential and logical step by step process. Georgetown will first launch projects to develop databases at a few locations. Once these are operational logical access will be provided through an index or directory. A data dictionary or vocabulary control will emerge to avoid inefficient retrieval. Once users identify information they require, they need to gain online access through a form of communication. In the early years of the Pilot IAIMS, while the basic LAN system is being installed, some users will have dial-up telephone access. In later years during the Interim and Full IAIMS stages, when the expanded LAN and digital PBX system are installed, access of information will be direct and the transmission mode will be transparent to users.

The Medical Center envisions an IAIMS network with two component parts in operation: one comprised of intradepartmental information network clusters that are microcomputer based and the second, a primary information network that is Medical Center-wide supported by minicomputers and mainframes located at key sites such as the Hospital, the Library and other key areas. In this manner some departmental computer needs can be met with small local systems, yet data transmission with larger computers for general resource information and interdepartmental transactions will be available through the communications system.

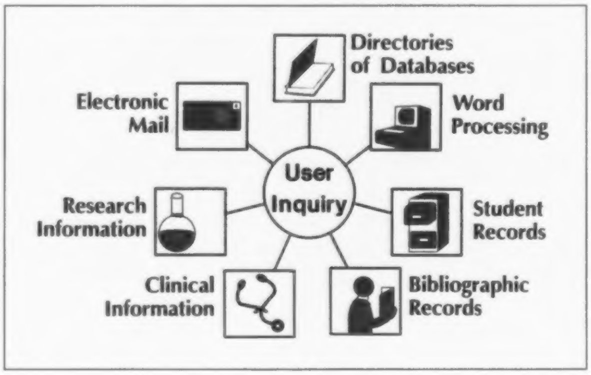
IAIMS core support services will provide the access, communications, and computer systems required to maintain basic network functions. These will include maintaining a directory of databases, electronic mail, word processing, decision support systems, bibliographic systems, and database management systems which will be daily operational functions. Also, part of the core services are software design of applications programs needed for clinical research, education and management functions. (See Figure 35 for illustration). It is planned to offer these services by upgrading the library's computer system for AIMC projects.

The schedule for development of databases in the early years of Pilot IAIMS is intentionally definitive in scope and content. It is necessary to begin a gradual program of local database development for units and departments in order to automate them. These local databases will be useful for teaching, patient care and research purposes. Integration of major resource databases accessed by numerous users will evolve, as the program matures. The library and some hospital databases are examples of the general information resources that many users will want to access.

Implementation and progress of IAIMS is, of course, dependent on availability of funds. Grants and gifts will be sought for the projects from a variety of sources as indicated in Section IX. The implementation timetable listed below indicates the three phases and the yearly milestones to be achieved. Emphasis has been placed on the first five years to allow for program flexibility and incorporation of new technologies in the later years as they become available.

FIGURE 35

Future Access Through IAIMS



IAIMS Program Objectives: The Three Phases

PROGRAM OBJECTIVES OF PHASE I (1 TO 3 YEARS)

PILOT IAIMS • **NEUROLOGY** • **NETWORK SYSTEM** • **AIMC**	The overall goal of this three year pilot project is to improve the transfer and utilization of biomedical information by developing a network system for Medical Center users. The project objectives include establishing a LAN, launching a neurosciences model experiment, enhancing clinical problem solving in health sciences education, providing electronic transmission capabilities for the chief executives of the Medical Center and launching the Academic Information Management Center (AIMC) in the library to train users and provide a computer laboratory.
IAIMS CORE SUPPORT SERVICES	In addition to training users in information access skills, implementation of IAIMS requires core support for development and for maintenance of integrated databases and for assistance in establishing academic medical computing projects for the faculty of the three schools (Medicine, Dentistry and Nursing). Translated into services this means the AIMC will serve as a focal point for launching the IAIMS network services as shown in Figure 35. This will enable Medical Center faculty, students and researchers without a local office system or access to the Hospital Information System to utilize services such as electronic mail, word processing and decision support systems available on the library's computer. Also, the directory of databases will serve as an informational resource for access to other databases such as bibliographical, clinical, research and student records. To accomplish this, the library will need to upgrade its computer to a high powered system with added storage and retrieval capabilities. Options are being considered.
PHARMACOLOGY	This three year project to develop a pharmacology information database will test the concept of using the computer as a memory extender for students and practitioners. It will allow instructors to concentrate on teaching fundamental concepts of approximately 250 drugs in the classroom. The library will provide an online database for student use on the other 1,000 (plus) drugs not covered in class.
LOMBARDI CANCER CENTER (LCC)	The proposed research project will examine if an IAIMS can enhance the interdisciplinary approach to patient care and research. Basically, this research study will identify information needs, determine the optimum format for storage and retrieval, develop an online model system and evaluate the effectiveness of the model and its applicability to other health care environments.
CONSORTIUM PROJECT	Consortial activities begun during the planning year will emerge as projects to further the IAIMS concept. The University of Maryland, Tufts University and Georgetown University will share experiences and resources in development of prototype IAIMS. Others will be invited to join.
NURSING PROGRAM	The Nursing project includes the "Nursing Clinical Care Simulation Programs" which involves developing an educational authoring system for instructional programs and a "Nursing Nomenclature Database" suitable for IAIMS users and applicable in the nursing field.
DENTAL	The major aim of the Dental project is to integrate computers in the educational programs of the school. Beginning with the Pilot IAIMS project, additional

	dental journals will be included in the miniMEDLINE SYSTEM. Design of an ideal "workstation of the future" including remote access and interactive video disks for students is planned.
AMBULATORY CARE	This project with Internal Medicine Associates (IMA), Department of Medicine, includes a clinical investigation and demonstration program to provide residents and medical students with improved educational capabilities involving improved access to library knowledge systems, development of clinical simulation programs and diagnostic systems for clinical decision making, organization of patient records, and physician's access to results of laboratory tests on patients.
EMERGENCY MEDICINE	This is a clinical project to improve the resident's ability to diagnose cases more accurately and to refer cases to specialists within the Medical Center for follow-up. It involves automated access and interface with diagnostic decision making systems, patient records (history) especially in IMA, referral system for tentative appointments with physicians, interface with Poison Control Center data, networking with health professionals in the community and an online system of literature (full text and bibliographic systems).

PROGRAM OBJECTIVES OF PHASE II (YEARS 4-5)

AMBULATORY CARE (IMA AND EMERGENCY MEDICINE)	Continue the projects initiated in the third year of Phase I.
IAIMS CORE SUPPORT SERVICES AND AUTOMATION OF OTHER DEPARTMENTS	The AIMC will continue the projects initiated in Phase I as part of the core support services of IAIMS. The IAIMS Management Committee will continue to consider projects to automate other departments of the Medical Center. Because there are close to 50 departments, project selection will be based on meeting the IAIMS criteria, feasibility and funding availability. See p. 77 for list of departments.
RADIATION SAFETY	Begin a research project to expand the radiation control database and to improve management of regulatory requirements on radiation hazards. This includes development of a comprehensive database, improvement of indexing language for immediate access to information, interface with sponsored programs to include new research grants, potential radiation hazards, networking with the National Bureau of Standards (NBS) and George Washington University (GWU) and improve report generation system.
LIBRARY INFORMATION AND AIMC	This IAIMS component will emerge once the AIMC is established. It is an applied research endeavor to enhance internal networking capabilities and access national databases needed by the Medical Center users. The project includes technical research to implement a switching mechanism allowing easy access to external databases without requiring sophisticated knowledge of unique database retrieval requirements. Interfaces and information projects will include access to computer resources and laboratory support for the IAIMS research projects, AMA network systems, information vendors (Dialog, BRS, NLM), full text systems through Mead Data and BRS, publishers project to evaluate online clinical review textbooks and encyclopedic information services, and optional

	laser disk technology project. Related interaction with NLM/AT&T/MicroMedic Imaging System to improve picture transmission and design of a standard template format for authoring tutorial and learning programs will be supported by the AIMC.
RADIOLOGY	Progress in transmission of images and picture archival systems are expected in the next few years. IAIMS will engage in a program with the Radiology Department to implement rapid transmission of images and to store and retrieve pictures.
CLINICAL LABORATORY	The manual used in the clinical laboratory will be maintained online through the IAIMS program. This will facilitate access as well as updating capabilities.
SURGERY	A project to explore online video transmission of surgical techniques holds promise as a useful educational feature.

PROGRAM OBJECTIVES OF PHASE III (YEARS 5-10)

IAIMS MANAGEMENT AUTOMATE REMAINING DEPARTMENTS	The program to automate the non-automated departments of the Medical Center will continue. Unfortunately, the IAIMS program cannot support all of them. However, in the fifth year an inventory of those departments needing automation will be conducted and a logical approach to assist them will result in new IAIMS projects. See p. 77 for list of departments.
IAIMS CORE SUPPORT SERVICES	A review of core support services will be conducted to determine ongoing and future needs of the Medical Center users.
NEW IAIMS APPLICATIONS	Adapt new technologies such as implementing full text and image transmission as part of IAIMS services.
RESEARCH	During Phase I and II many research projects will emerge from the pilot programs. Some will be speculative and and futuristic and will involve high technology and cooperative programs with non-Georgetown laboratories, institutions and corporations.
MEDICAL INFORMATICS	The National Biomedical Research Foundation based at GUMC has proposed to develop a new computer high level language that uses a programmerless approach. It is expected to be the next step after MUMPS and has been called a MEGA language. Once this language is developed, the IAIMS project will apply it as appropriate. Other IAIMS related research activities in Medical Informatics are anticipated.
NEW INFORMATION TRANSFER SYSTEMS	Engage in experimental activities with new technology for information transfer. This work will incorporate the use of fifth generation computers, mass storage capacity disks and advanced communications systems. Transfer mechanisms for real time interface between diagnostic systems and information systems may be available for application. During this period, developing technologies and system concepts should begin to enter Stage III and, therefore, user impacts, new products and services will emerge. See Figure 36 for examples of developing technologies.

FIGURE 36

The Three Phases of the Ten Year Timetable for IAIMS

Pilot IAIMS Phase I

Years 1-2	Academic Program	Network System
1985-1986	1. Pilot IAIMS. 2. Neurology. 3. Pharmacology. 4. Lombardi Cancer Center (LCC) 5. Academic Information Management Center (AIMC): develop user training 6. Consortium Project. 7. Nursing. 8. Dental. 9. IAIMS Core Support Services	1. Recruit Program & Network Managers. 2. Include Ass't Chancellor for Information Resources in IAIMS Management Committee. 3. Acquire advanced computers and peripheral equipment. 4. Acquire/install LAN. 5. Design/acquire decision support programs for Pilot IAIMS and research projects. 6. Test, modify and implement. 7. Initiate full IAIMS non-video transport system (expand LANs and begin PBX).
Year 3 **1987**	1. Finish Pilot IAIMS. 2. Finish Neurology. 3. Finish Pharmacology. 4. Finish LCC. 5. AIMC ongoing. 6. Nursing ongoing. 7. Dental ongoing. 8. Begin projects in Internal Medical Associates (IMA) and Emergency Medicine related to patient records. 9. Begin Radiology. 10. Consortium Project. 11. Clinical Laboratory.	1. Install initial elements of full IAIMS transport system (expand LANS). 2. Begin PBX campus wiring. 3. Continue software design. 4. Expand advanced computers for new Pilot IAIMS projects. 5. Evaluate 1st Pilot IAIMS. 6. Evaluate 2nd Project—Research IAIMS Applications Program.

Interim IAIMS Phase II

Year 4	Academic Program	Network System
1988	1. AIMC ongoing. 2. Finish IMA and Emergency Medicine projects. 3. Begin project in Radiation Safety. 4. Establish LIS in selected affiliated hospitals. 5. Continue Consortium project. 6. Continue Nursing. 7. Continue Dental. 8. Continue Radiology. 9. Continue Clinical Laboratory. 10. IAIMS Core Support Services.	1. Operate IAIMS transport system. 2. Begin 3rd IAIMS Project—full implementation. 3. Expand hardware and terminals connected to transport system. 4. Explore video transport system. 5. Select Pilots for video imagery. 6. Procure video/imagery system. 7. Expand project staff.
Year 5 **1989**	1. Expand the AIMC. 2. Expand systems to other departments. 3. Continue projects in Radiation Safety. 4. Expand LIS access in affiliated hospitals. 5. Expand selected programs to community physicians' offices. 6. Explore video project with Surgery.	1. Video/imagery Pilot. 2. Acquire equipment for video project. 3. Continue full IAIMS operation. 4. Expand as required (terminals and connections). 5. Expand project staff to handle video project.

Long Range IAIMS Phase III

Years 6-10	Academic Program	Network System
1990-1994	1. Continue IAIMS Core Services. 2. Automate remaining departments. 3. Develop new and innovative applications of IAIMS. 4. Expand research activities in Medical Informatics.	1. Continue fail-safe operation of network. 2. Experiment with new technology for information transfer. 3. Convert anticipated systems to newer computers. 4. Engage in technical research.

FIGURE 37

IAIMS Implementation Schedule

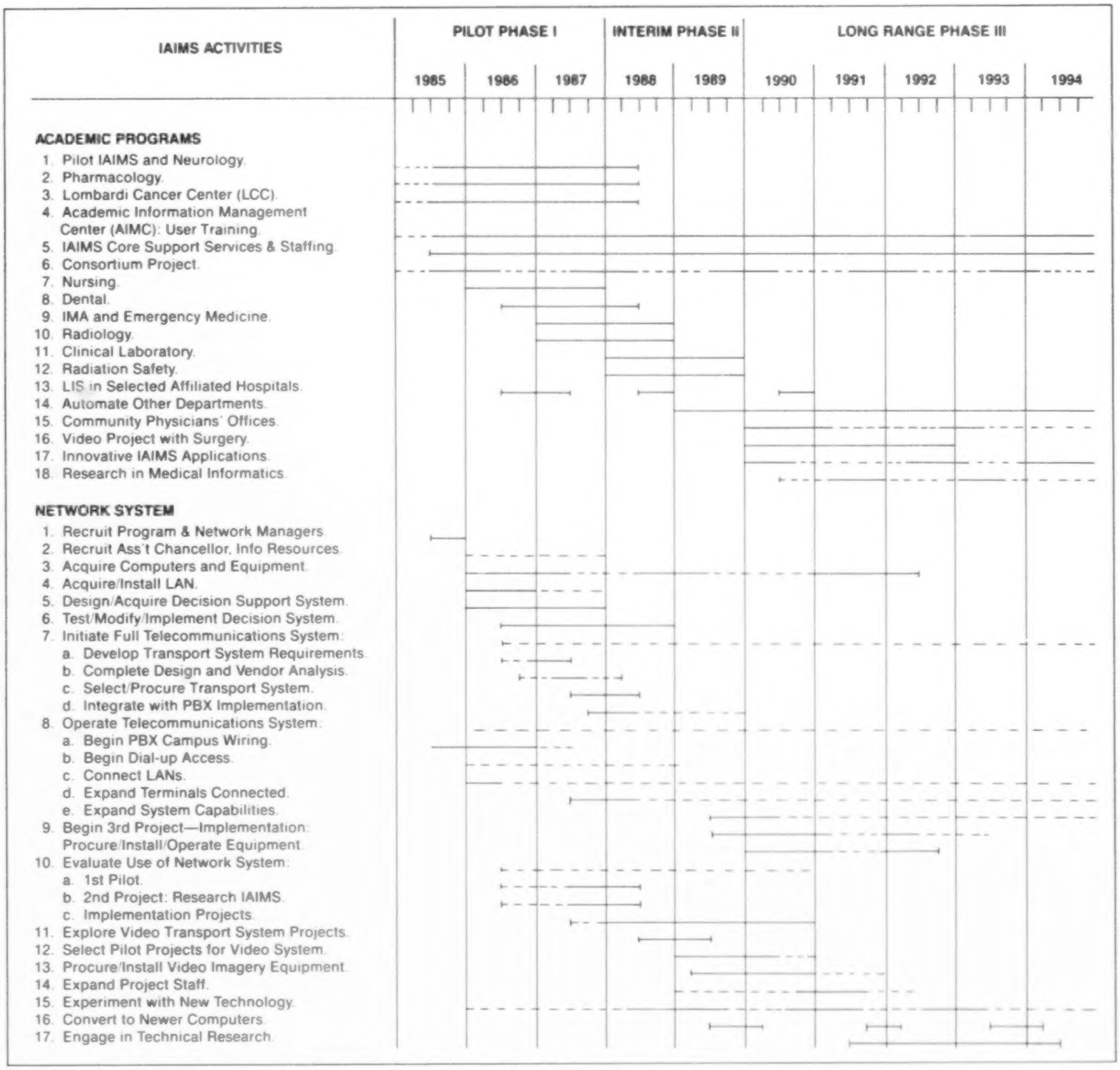


FIGURE 38

Developing Technologies: Effect on Systems and Users*

Technical Systems	System Concepts	Impact on Users
Computer/Hardware: Minis & Micros Special Purpose Machines	Networking: Local Accessibility Distributed Processing Distributed Databases/Partitioned Files Peripheral Storage Local Area Network	System Database Managers: Costs Efficiency
Workstations: Intelligent Terminals Word Processors	Mass Storage:	System Operators: Data Entry Local Processing
Telecommunications: Digital PBX voice, data, image	Data Input: Directly from source	System/User Interactivity: Local Manipulation Local Intelligence Conferencing Collaboration Online Browsing Color and Graphics
Memory: Magnetic Bubble Charge Coupled Devices Laser Beam Optical Disk Holographic	Improved/Simplified Software: Programmerless Approach Decision Support Database Management System	Products & Services: Speed Quality Effectiveness Convenience
OCR Techniques	Coupled Micro-imaging and Computer Systems	System Understandability: Ease of Access Ease of Learning Assistance
Other Scanners		
Microimaging		Copy Availability: Hard Copy Soft Copy Disks
Fascimile Transmission		

*Source: Adapted from information provided by King Research Inc., 1983.

Departments/Divisions Interviewed for the IAIMS Self-Study Inventory

- Anatomy
- Anesthesia
- Biochemistry
- Chancellor's Office
  - Administrative
  - Radiation Control
- Clinical Laboratories
- Community and Family Medicine
- Community Dentistry
- Dahlgren Memorial Library
- Dental School
  - Clinic
  - Dean's Office
  - Student and Academic Affairs
  - Student Services
- Educational Media
- Emergency Medicine
- Emergency Medicine—Poison Center
- Hospital Information System
  - Administrative Office
  - Operations
- Immunology
- Lombardi Cancer Center
- Medical School
  - Admissions and Records
  - Associate Dean, Students
  - Associate Dean, Undergraduate
  - Continuing Medical Education
  - Controller
  - Faculty Practice Plan
  - Financial Aid
  - Sponsored Programs
- Medicine
  - Administrative Offices
  - Ambulatory Medical Services
  - Billing and Collection
  - Cardiology
- Microbiology
- Neurology
- Nursing School—Graduate Programs
- Obstetrics and Gynecology
- Ophthalmology
- Oral Diagnosis
- Pathology
- Pediatrics
- Pharmacology
- Physical Medicine and Rehabilitation
- Physiology/Biophysics
- Psychiatry
- Radiation Medicine
- Radiology
- Surgery

Evaluation of IAIMS

A number of achievements and critical milestones will be reached during the ten year implementation stage. An evaluation process has been established that includes criteria for measuring the outcomes of these achievements and milestones. The results will be reported to the Chancellor and the Administrative Council so they can judge the progress of the IAIMS program. In addition, the IAIMS Management Committee and Program Manager will use the data to incorporate appropriate changes when necessary. The reporting mechanism will enable the Medical Center Administrators to determine if IAIMS meets their expectations.

There are four major tasks involved in measuring and evaluating achievements of the IAIMS projects:

Criteria: To measure achievements against the milestones of the projects.

Modifications: To establish mechanisms for taking corrective measures if needed.

Research: To identify research opportunities to improve IAIMS.

Evaluate Implementation: To review progress toward implementation.

Criteria

Quantitative and Qualitative criteria will be used for measuring achievements of goals and critical milestones which are as follows:

1. Timeliness in building a quality directory and access to IAIMS databases. (Timeframe: ongoing for duration of the project.)
   a. Review contents of databases selected for IAIMS.
   b. Ascertain oversights and change or correct databases.
   c. Assure that databases meet needs of users.
   d. Meet or adjust target dates without unreasonable delays.

2. Achievements in updating the logical access database. (Timeframe: concentrated during Phase I.)
    a. Review procedures for updating databases.
    b. Revise as appropriate.
    c. Test and measure if updates are timely enough to meet user needs.
3. Availability of IAIMS databases. (Timeframe: begin first year of Phase II, continue ongoing.)
    a. Measure amount of time required to make databases available.
    b. Review achievements and ability to reach milestones.
4. Integrate existing databases into IAIMS. (Timeframe: begin first year of Phase II, critical milestone in Year 5.)
    a. Establish priorities for integrating databases.
    b. Make adjustments in timeframe as needed.
    c. Measure timeliness in achieving target dates.
5. Automate non-automated functions by establishing databases. (Timeframe: begin Phase I through Phase II, critical milestone in Year 3.)
    a. Identify databases that need to be created.
    b. Prioritize design and programming of new databases.
    c. Measure timeliness in meeting target dates.
    d. Make adjustments as necessary.
6. Timeliness and quality of communications network. (Timeframe: begin Year 1 of Phase II; continue to critical milestone in Year 6.)
    a. Install, test and improve communication system.
    b. Review quality of interfaces and determine if they meet users needs.
    c. Make adjustments.
    d. Measure ability to meet target dates and critical milestones.
7. Success in promoting IAIMS within Georgetown. (Timeframe: ongoing, critical milestone in Phase III, Year 8.)
    a. Survey users for opinion on IAIMS.
    b. Increase publicity if needed to promote success.
    c. Report status of IAIMS at major Medical Center meetings.
8. Success in education and training users to input and retrieve from IAIMS. (Timeframe: begin Phase I, continue to critical milestone in Phase II, Year 5.)
    a. Measure success of educational programs (test questionnaires and monitoring use of the system.
    b. Determine if faculty develop useable educational, research and patient care databases.
    c. Measure ability of students to use the system and develop their own personal files.
    d. Make adjustments and changes as needed to assure success of IAIMS.
    e. Establish ability to meet critical milestones.

During the review of achievements and milestones, a number of critical questions will be asked such as:

Have policy guidelines been issued? Agreed to? Implemented? On time?
Has funding been released?
Have key organization slots been assigned?
Are designs being submitted?
Is equipment being ordered?
Is staff being hired?
Are technical plans being approved/accepted by sub-units of the Medical Center?

Modifications

How corrective measures will be taken if needed:

1. Regular reporting mechanisms established by management of IAIMS/ AIMC will provide information on whether the goals are being met.
2. Management of IAIMS/AIMC will revise approaches or change priorities to assure that goals are met.
3. New available technologies, new needs and innovative ideas will be considered regularly during implementation stages.
4. Changes that raise major policy issues or major financial needs will be reviewed by the Chancellor and the Administrative Council.
5. Once decisions are made to change or correct the IAIMS operation, resources will be identified.
6. This continuing review cycle will be ongoing for the duration of Phase II.

Research Opportunities

A number of research opportunities will become available during the development phase. Some have already been identified. Research will include but not be exclusive to health education, patient care, basic and clinical sciences research, applied and other related experimental and innovative applications in the transfer of biomedical information. Research and developments in the use of new technologies for document delivery (print or nonprint) such as computerized full-text storage and retrieval, videodisk, videotext, teletext and use of computer graphics will be conducted in the transformed AIMC "library." Research in approaches to database development and creation of knowledge bases is already underway, and it is quite evident that this scenario will continue to be conducted by the new "library." Experiments in innovative communication and interface approaches with applicability at other sites also present opportunities for research.

As more faculty, staff and students become knowledgeable about use of computers, new research questions will be raised. The research stages will range from database development to knowledge bases to artificial intelligence. More will become known about information seeking behavior of individuals because the computer enables effective monitoring of users. Opportunities to conduct research studies in this area as well as decision making processes will be utilized.

Georgetown has considered and identified several research opportunities which are included in the proposed projects with departments of the Medical Center. The Lombardi Cancer Center project, for example, includes several research questions.

Evaluate Progress Towards Implementation

Methods for ensuring successful and appropriate completion of IAIMS will include evaluation as an integral part of the design, development, implementation and operation of the system. Early error detection results in less costly error correction. Conservative estimates indicate that the cost of error correction increases by an order of magnitude for each stage of the design process that is completed before detection.

Evaluation will be performed in parallel with design, development and implementation activities. Evaluation of the design and implementation of the system is based, to a large extent, on the pilot projects (i.e., the goals and objectives identified) and on the results of requirements analyses. This may seem obvious but is often not the case. Frequently, systems are evaluated from a systems viewpoint (especially in the case of automated systems) and not from that of the participants who interact with it. In other cases, systems are evaluated from the viewpoint of only some of the participants (e.g., the administrators or the users). Such studies are often incomplete and, therefore, invalid. For this reason, our approach is to integrate evaluation activities in each pilot program so that IAIMS is effective and appropriate to all who interact with it. The principle objectives of this type of evaluation program are:

1. To determine if user needs are being met.
2. To reveal specific needs, if any, for modifying or correcting the system before changes become to costly.
3. To ensure that the cost, performance and effectiveness levels set forth initially are achieved by the operational systems.
4. To provide a basis for future planning and for general policies such as pricing.

In order that the evaluations be an integral part of the IAIMS development effort, the IAIMS Management Committee will serve as an evaluation team also. But in order that the evaluation be as impartial and objective as possible, there is a possibility of an evaluation by external consultants working closely with the IAIMS Management Committee.

The exact scope and nature of the evaluation effort is dependent on the nature of the project objectives. In fact, each specific objective will be as measurable as possible (either quantitatively or qualitatively), and will include an approach to measuring progress and achievements. This very process is an exercise in thinking through the implications of implementation and may help to discard unobtainable objectives.

The evaluation addresses, but is not limited to, the following issues:

1. Who will do the evaluation?— The IAIMS Program Manager and IAIMS Management Committee will be responsible for conducting the evaluations.
2. Will the system be evaluated in its entirety or in discrete portions?—Two approaches will be taken. The first includes evaluation of each distinct project. The second involves an overall review for each major Phase of IAIMS.
3. When will the evaluation be performed?— During each project and critical milestone.
4. How will the results of the evaluation be used for further system developments?—Improvements and modifications will be incorporated into each project. Cost effective and worthwhile projects will be expanded and those that are unworthy will be eliminated.

The evaluation timetable, to a large degree, mirrors the implementation timetable to the extent that key evaluation points coincide with critical milestones. But the evaluation timetable, at each key evaluation point, also indicates options available at that point. This serves to assist in determining the range of potential directions open. These options can then themselves be reviewed and evaluated. Such an approach ensures flexibility in system development.

In times of rapidly changing technology, it is appropriate to carefully evaluate development of a large and complex system such as IAIMS. The proposed mechanisms will provide valuable data for Georgetown to analyze the progress of IAIMS.

IAIMS Implementation Plan: Conclusion

The application of information technology is a strategic necessity in today's competitive world. The health field has always been information intensive, requiring the ability to use recorded knowledge and merge it with current clinical and research findings to create new knowledge for the world's health information base. This cyclical process generates an immense body of information that health providers must use in the delivery of quality patient care. It is especially pertinent at Academic Medical Centers because they provide state-of-the-art education, patient care, research and management.

Therefore, it is vital to keep Medical Centers such as Georgetown at the cutting edge of information technology. What faculty, researchers, practitioners, students and staff know, and how they gather information is critical to both their daily activity and their future development. Since they are responsible for the well being of our population, they should have appropriate tools to keep abreast of information and to engage in lifelong learning.

Because of this need, the Georgetown University IAIMS plan represents more than a plan, it is a moral obligation to move the Medical Center forward in the Information Age, and to strive for continued excellence by implementing advanced information technology to improve operations.

Network

The intent of the plan is to improve the information access, process and communcation mechanisms by establishing a network system to integrate and interface databases and to accelerate the transfer of information across the departments and units of the Medical Center. Network access will be internal and external. The idea is to give people tools "to access the right information in the right form at the right time."*

Technology—Hardware/Software

This task is not as simple as it might appear. It is dependent on continued technological breakthroughs, use of fourth generation computers, development of high level languages (the "programmerless" approach), advanced diagnostic and instructional software, progress in Medical Informatics with artificial intelligence systems and knowledge bases, improved bibliographic and full text databases, skilled and talented people and lastly, but of major importance, high speed communications systems with capabilities to transmit data, voice and images.

Applications Programs

The raison d'etre for IAIMS, of course, is to enhance patient care by making information more available to health workers. This information is comprised of varying types of databases such as bibliographic, patient records, educational systems, expert systems and administrative data. What we hope to achieve is a logical merger or integration of these databases so redundancy is eliminated and access is facilitated. Participation by all GUMC units begins the process to assure that this can be achieved in an integrated fashion even though the data may be stored in a distributed system of computers.

Workstations

The personal computer sitting on a desktop will play the most dramatic role in development of a successful IAIMS. This fantastic tool which has introduced the workstation concept evident today, has already emerged as something "everyone" seems to want to conduct their daily work. What is now a station with a PC, printer, and modem with capability of storing and manipulating limited local data as well as tapping external resources through networking will become a high powered station in the future. Technical experiments are already being conducted in corporate and federal laboratories in use of optical disks, video disks, picture and voice transmission that will obviously change the workstation in the future.

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*"Pulling It All Together: The Power of Software and Services." Time 1984 Oct. 8.

User Training

Of course, users must first learn how to use these new tools before they can feel comfortable in accessing and manipulating information. With proper instruction they will conduct their daily tasks easier and faster. For this reason, IAIMS at Georgetown places high priority on development of an Academic Information Management Center where the teaching, training, experimental and consulting environment will enrich the lives of students, faculty and researchers.

IAIMS Prototype

These, then, are a few of the requirements for developing an IAIMS prototype. The plan developed at Georgetown is only one approach for creating an IAIMS model. Other institutions with different capabilities will develop divergent IAIMS. Organizational and technical aspects of the network system, for example, will probably be very different at each institution. Nevertheless, it is hoped that the aggregate plans of all the current IAIMS centers will contribute useful information to the NLM and individual assistance to those institutions planning future integrated systems. It is with this intent that Georgetown developed this strategic plan.

The plan will serve as a framework which GUMC will use to move from Stage I to Stage III of technological development. The timetable represents a reasonable path to be followed which is dependent, of course, on availability of funds and technical advances. Although one or the other factors could accelerate or delay the implementation schedule, the plan provides a valuable strategic and tactical guideline for coping with management of information in the future.

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Appendices

A. Conceptualizing IAIMS: Broering presentation at the NLM IAIMS Symposium, October 17, 1984.

B. Georgetown University Affiliations:
   Major Georgetown University School of Medicine Affiliations
   Other Georgetown University School of Medicine Affiliation Agreements
   Georgetown University School of Nursing Affiliations
   Georgetown University School of Dentistry Affiliations
   Georgetown University Hospital Affiliations.

C. List of Participants in the IAIMS Project.

D. IAIMS Executive Advisory Board Members.

E. IAIMS Executive Advisory Board Meeting Programs.

F. Micro Day Demonstrations Program.

G. List of Institutions with Georgetown's IAIMS Planning Information.

Appendix A

Conceptualizing IAIMS: The Process of Definition and Policy Development at Georgetown University Medical Center

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In: Planning for Integrated Academic Information Management Systems: Proceedings of a Symposium sponsored by the National Library of Medicine, October 17, 1984.—Bethesda, Md.: The Library, 1985. p. 20-24; 38-43.

Introduction

"We are drowning in information, but starved for knowledge."[1] These words of John Naisbitt, author of *Megatrends*, especially describe the health field. An immense body of health information, uncontrolled, unorganized, and thus indigestible, is perhaps less a resource than it is a famine. IAIMS is a vital force because it provides the concept by which we can strategically plan to bring order to this chaotic situation—not in the next generation, not in the next decade, but now.

The intent of this paper is to provide a few insights of Georgetown University's approach to the IAIMS planning process. It is an attempt to share an experience while depicting and addressing issues raised at the Medical Center, rather than to describe an implementation model or operational guide for others to follow.

As one of the initial contract recipients of the IAIMS program launched in September, 1983, the Georgetown University Medical Center has been engaged in the information management planning process for approximately twelve months. Medical Center-wide involvement and consensus development are progressing through both a top-down and bottom-up approach. To accomplish the work of this highly complex strategic planning project, tasks and assignments were divided among a number of Medical Center planning teams. An IAIMS Development Planning Team with representation from each unit of the Medical Center (the Schools of Medicine, Dentistry, and Nursing, the University Hospital, and the Library) was assigned key responsibility for the development of an IAIMS implementation plan. Technical, Informational, and Financial Teams, whose members were chosen for their professional expertise, were delegated specific planning tasks.

Consultants were selected to provide services. One consultant was asked to manage an Executive Advisory Board comprised of key individuals in the health education and private sector who would provide guidance during the planning process and assure that the Georgetown IAIMS project was well directed. The other consultant assumed responsibility for working with the teams to serve as an "architect" for the implementation plan [see Figure 7].

Key IAIMS Planners

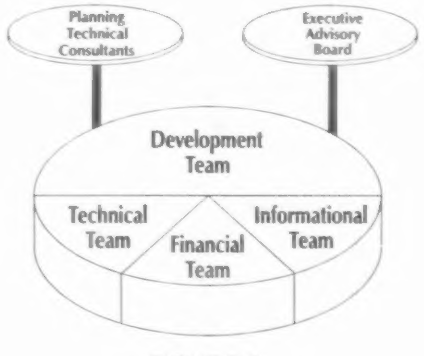

FIGURE 7

Definition of IAIMS

A number of meetings, both at the Executive Advisory Board and the Planning levels, centered on what it meant to have an IAIMS network and what form IAIMS would take at Georgetown. Everyone understood that the basic concept is to improve the flow of information and "use computers and communications technologies to bring together operational and academic information in support of health research, education, patient care and management."[2] However, the planning teams soon recognized that varying interpretations about IAIMS existed, depending on an individual's perspective.

It is difficult to visualize IAIMS in an operational mode because it is but a vague concept and experimental in nature. It is an idea without physical presence, somewhat analogous to the "University Without Walls" concept. In future years, it will take shape at institutions according to the mold created by its planners, and the end result will be an IAIMS which meets a particular institution's need and which fits its organizational governance structure. Today, however, NLM is pioneering to create a number of prototypes in different settings.

Elements of the Definition

The key planning participants at Georgetown undertook an exercise to define IAIMS so that its meaning could be more concrete and planning could be more realistic and more effective. From the varying definitions submitted by the participants emerged a general understanding of what IAIMS meant to Georgetown. The elements comprising our definition included [see Figure 8]:

1. the concept of IAIMS: the ideas, significance, need and evolutionary process;
2. the mission and objectives: translation of the idea into programs to make IAIMS a reality—the intent of the programs being to further knowledge utilization and transfer of academic information in support of education, patient care, research, and management;
3. governance, organization and policy: merging the IAIMS project into the institution's structure—defining duties, responsibilities, and resources;
4. functional and physical aspects: the multifaceted programs required for useful conjunction of an IAIMS network include: (a) information databases, (b) electronic storage and retrieval computer systems, (c) transmission systems involving a telecommunications network for dissemination of information, and, lastly, (d) an educational training function to assist users to access the system.

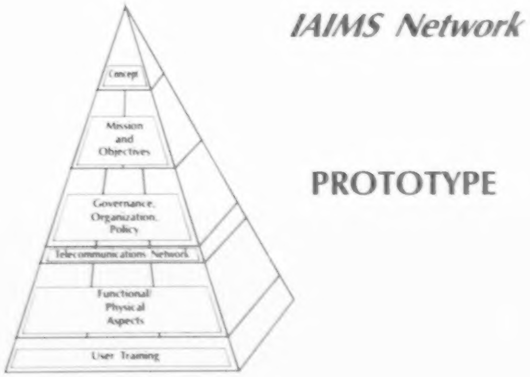
IAIMS Network
Concept
Mission and Objectives
Governance, Organization, Policy
Telecommunications Network
Functional/ Physical Aspects
User Training
PROTOTYPE

FIGURE 8

The Concept

Conceptually, an integrated medical center with an information transfer system is an environment which will permit our health professionals to convey information rapidly to others. Students, educators, researchers, clinicians, patients, and administrators will use it to improve the quality of their purpose at the Medical Center.

A concept needs a physical basis to become a reality. Physically, IAIMS requires an advanced electronic communications system or some other way to develop a network. In addition to voice transmission, people will need to transmit other forms of information (data, image, television, etc.) and, perhaps more importantly, they will want to synthesize information from a number of sources and explore new means of communicating with each other. The presence of such a capability will be self-reinforcing because the more people can improve upon their cognitive abilities through IAIMS, the more they will use its resources for their own self-development.

Of the three stages of technological development, IAIMS is currently (at best) in Stage 1: that is, substitution, or the transfer from paper-based systems to computer-based systems. To reach this stage, academic information should be adequately harnessed so it can be managed effectively [see Figure 9].

IAIMS is an evolving entity, for although the physical capabilities and technologies which can be applied already exist, the concept of reducing paper and promoting electronic communication between

Three Technological Stages

1. **Substitution—Transfer from paper-based system**
2. **Innovation—New services previously unavailable**
3. **Transformation—Change ways of handling information**

FIGURE 9

and among people has not yet had time to be understood clearly and put into practice.

In order to move into Stage 2: innovation, or the ability to provide new services previously unavailable, a major educational and training effort is needed. Assuming there is at least the beginning of a new physical entity in place, people need to learn to think as information seekers and to apply new technology. Once they become comfortable functioning in this mode, new innovative approaches and ideas can emerge. To support the needed training, service, consultations, and maintenance, a new organizational unit will be necessary. Institutional information policy issues must also be addressed organizationally.

To achieve the final Stage 3: Transformation and unconscious awareness (a total change in the ways we handle information), IAIMS will need constant fine tuning and adjusting. When that occurs, the Medical Center will have created a new medium for the pursuit of intellectual excellence. The methods and means of using information will change beyond anything imaginable today.[3]

IAIMS as a concept is a "good idea" which, if allowed to unfold, will become a sophisticated electronic communications system, capable of transmitting a variety of forms of information to health professionals associated with the Medical Center. In the future the IAIMS will become a new resource of the Medical Center to meet the shift toward our evolving information society.

The Mission—Goals and Objectives

The AAMC report stated that, "The challenge before the biomedical community is to augment the power of the human mind to use knowledge."[485] Herein lies the rationale for the programs which will comprise IAIMS at Georgetown. The mission, goals, and objectives of the Georgetown University Medical Center (GUMC), as in other medical centers, are consistent and related to IAIMS in that continued academic excellence in teaching, patient care, and research are of utmost importance. While the scholarly academic setting provides new knowledge to refresh and update the health care system on a daily basis, the use of this knowledge is unsystematic, and the ability to transmit information in an accelerated manner to practitioners is highly unorganized.

The programmatic meaning of IAIMS at Georgetown, then, is to establish objectives to expand the use of recorded knowledge, to improve the flow of academic information, and to use the computer as a memory extender. This can be accomplished by designing a system to integrate or cross-over information so it is readily accessible for use in education, research, and patient care. The interests of Georgetown will be served by implementing an information system totally dedicated to propagating academically-oriented information. In the initial years during a pilot program, Georgetown will concentrate on supporting changes taking place in the concept and methodologies of health professions' education and clinical care, primarily the movement away from paper and memorization to independent learning, and the development of problem-solving skills in patient care.

In practical terms, this will involve fully automating a clinical teaching department to serve as a model linked to the IAIMS network. Departments with most direct communication with this initial site will be linked as nodes throughout the network. The offices of the deans of the Schools of Medicine, Dentistry, and Nursing, and of the Chancellor of the Medical Center will also be linked as nodes to accelerate transfer of academic and management information. Our automated Library Information System (LIS) will serve as a hub of the network activity which receives, integrates, and disperses academic information to components of the Medical Center. The mini-MEDLINE SYSTEM, a self-service bibliographic search system based on a subset of the NLM MEDLINE database, will be enhanced by adding abstracts and by making it available from clinical sites. The Hospital Information System will become part of the network which concentrates on transmission of clinical information. The educational aspects will include developing comprehensive curricula databases, acquiring existing decision-making systems, installing a database management system, and designing additional software programs to fulfill educational needs.

To support these efforts, an Academic Information Management Center (AIMC) for training of faculty and students on computer use in a self-teaching environment will be developed in the Library. Integrated workstations equipped with access to appropriate educational, patient care, and research information will be established at designated sites in locations throughout the Medical Center. To take advantage of these information tools, users must be given opportunities to gain "computer literacy."

Organization, Governance and Policy

In order to make the programs a reality, the plan must address how IAIMS will become an organizational entity, what will be its governance and structure, and how programmatic aspects will become functional and operational. IAIMS will be shaped by the concept of strategic management. It will be an organizational entity responsible for the coordination and policy direction of the functions as designated by university units. Operationally, this involves implementing and maintaining a network system architecture, developing and furthering an integrated technologies applications portfolio, stimulating internal and external partnership relations, and creating strategies to maximize financial investment and to minimize risk and maintaining the network system.

Organizationally, IAIMS will serve a coordinating function for an existing decentralized system of day-to-day data and information processing operations.

The governance for this project rests in the Office of the Chancellor. A well-qualified individual, reporting to the Chancellor, will coordinate IAIMS activities and work cooperatively with functional managers of existing systems. This individual will become the IAIMS program officer or the "super-integrator"[6] for the Medical Center. Because IAIMS is dependent on a team effort, the IAIMS leader will work with an advisory committee similar to the IAIMS Development Team, which consists of representatives from all the Medical Center units.

A number of protocols, standards and policies are required for IAIMS to function successfully. Seven key institutional information policy issues have been identified which are being addressed and considered by appropriate bodies in the University. They include:

- Access
- Confidentiality
- Fees
- Quality Control
- Security
- Standards
- Ownership

No attempt has been made to rewrite existing policy because Georgetown, like other institutions, is not totally lacking segments of an information policy. Instead, efforts have been made to merge commonality, acknowledge differences and develop one document. For example, the Faculty Handbook[7] addresses policy issues such as ownership of faculty works, including publications, inventions and patents, which can govern the creation of academic software. These may differ from the University's policy for design of operational software serving various administrative functions. The University Hospital has a policy concerning confidentiality which differs from the Library's policy of public access to information. The Library has a policy concerning fees which may not apply to other units of the Medical Center. These various policies have been examined to produce a general policy statement. Once established, it will be implemented by the program officer representing the Chancellor.

In addition to requiring coordination within the Medical Center units, the IAIMS program will extend beyond the boundaries of the Medical Center campus. IAIMS may originate in the Medical Center initially, but the architecture of its telecommunication links must involve at least the main campus. The Law Center and outside users may also be considered. We will begin with a Local Area Network (LAN) and then install a new telecommunication system throughout the campus, using digital PBX with use of fiber optics for data, voice and image transfer capabilities.

Functional/Operational Aspects

To take physical shape, IAIMS needs technical building blocks, properly placed in an orderly fashion, which include advanced computing, communications and video systems. A distributed systems approach to computers is already in place at Georgetown and IAIMS will preserve this functional autonomy. IAIMS, however, will interconnect and interface computers managed and owned by the five units (Schools of Medicine, Dentistry, and Nursing, the University Hospital and the Library) through a transmission system serving as the backbone of the network.

The Georgetown IAIMS will include the following functional and operational elements.

1. knowledge/information databases: these are the software applications programs driving the system;
2. computer systems: a distributed system of computers handling storage, retrieval, and dissemination of information in a variety of formats;
3. transmission system: the network and hardware system needed for transmitting information in data, voice and video format;
4. training and education: a means for training users (faculty and staff) through an Academic Information Management Center (AIMC), consisting of a computer-training laboratory, an interdepartmental trial area, and a consulting service on information management and software development.

Conclusion

While the IAIMS network at Georgetown is still in sketch form and needs more brush strokes, a clearer image is emerging through the planning process. An implementation plan covering a ten-year period will address the logical steps Georgetown intends to take to create an IAIMS prototype. The pilot program will provide a useful experience which can carry over to implementation of a full IAIMS. The network system will serve as a vital key to providing the means for moving information. By integrating databases into a network, useful conjunction of recorded knowledge can occur, needless redundancy can be eliminated, and a more effective means of accessing information can be accomplished. Through these initial steps, Georgetown plans to move toward achieving an operational IAIMS.

If the IAIMS concept is properly nurtured and allowed to unfold, instead of "drowning in information," the Medical Center will be able to build better sources of knowledge for users, thereby furthering the established goals of excellence in education, research, and patient care.

Acknowledgement

It is a pleasure to acknowledge the assistance provided by all the members of the Georgetown University planning teams and consultants who have worked directly and indirectly on defining the IAIMS concept. Specifically, I am indebted to the members of the Development Team, who provided valuable input and suggestions for this presentation given at the NLM Symposium in Bethesda, Maryland, on October 17, 1984. Their dedication and continued efforts have enabled Georgetown to develop a course of action for creating an IAIMS prototype.

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Questions and Comments*

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Q. Morris Hawkins, Special Assistant to the Dean, Howard University College of Medicine

I think I have a loaded question, but I would like to request that it be answered by Homer Warner and Marjorie Wilson.

In presenting your plans, you discuss the four functional areas of administration, research, teaching and clinical service. From there you go on to talk about getting involved in the planning process through a number of projects. Both campuses have rather complex structure because you are involved with several schools. You talk about individuals who come into the planning process with the responsibility and, indeed, the authority to make policy on behalf of the schools they represent. I am wondering, in the process of policy-making, how you are managing priorities in terms of either the four functional areas or the different schools. Are you looking at objectives of those schools, the areas which you will attack, or are you prioritizing subjects or objectives based on the programs and the directions they are taking? Who is managing the priority setting: your advisory or policy-making committees, or the vice president's or chancellor's office?

A. Majorie P. Wilson

I mentioned that we are doing inventories and needs assessments in each of the units represented on our campus. One of the things we realized immediately was that those organizational units, schools, are very different from one another.

I do not need to describe to this audience what a medical schools is like. It has different categories of resources and activities than does, for example, the law school. The law faculty stands at about 75, whereas the medical faculty consists of over 500 full-time and as many voluntary, faculty. These units are not only different organizationally and from the standpoint of activity, but in terms of where they put their priorities. For example, the nursing school has a very large student body. It is one of the largest nursing schools in the country. However, compared to the medical school, its research activity is relatively limited. The School of Nursing certainly has a research program, but it is not as extensive as the medical school's. So the needs assessments were geared to each particular institution and its particular problems.

As I mentioned, feasibility is an element of any needs assessment. That was another reason for selecting people (to guide those individual units' self-studies) who were sufficiently senior in the organization to have some concept of what was feasible, to know the budget, to know the priorities they would use to allocate resources toward this information field. It will be sorting-out process, and there will be differences among the administrators as to the mechanisms they will want to use.

In the medical school I have elected to get a lot of input from our faculty because I think that it is essential, in running the medical school effectively, to have faculty coming right along with you. The priorities will differ from one school to another.

We hope, in the selection of pilot projects, to include one which is multi-institutional. One possibility cuts across the departments in the medical school and involves the hospital. It is very research-oriented, but also has elements of education and patient care. That is one kind of slice.

Another kind of project involves one school. You might have noticed on my slides that I included the College of Pharmacy. It is very manageable as a model. We could not take the whole medical school for our model. Another possibility is the Cancer Center, which is located in the University Hospital.

I was very interested in what Homer Warner had to say about the relationship with the Hospital. We have some of the same kinds of problems on our campus. How will we inter-face the data systems? What will be their policies and our policies? How can we get together on those things? We have the same questions about the telecommunications system. We are hoping that our pilot projects will illustrate different aspects of the policy questions we have to sort out.

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*The Questions and Comments relate to papers presented at the NLM Symposium on October 17, 1984. Papers not included in this Appendix from the IAIMS institutions participating in the symposium were Columbia University, University of Maryland and University of Utah.

A. Homer Warner

We have some concerns about raising hopes too high for an early solution to everyone's problems. So what we have done is work informally on those tasks where people are pushing the hardest. In preparing our initial proposal, we did a very quick assessment of needs and we saw there were some needs we knew very well we were in a poor position to handle—things like handling biochemical data and keeping files of amino acid sequences. We have needs for such information but we don't think we are in any way uniquely set up to tackle those particular problems. So we are really going for those things where we have the tools available to tackle them. There are an infinite variety of things to do. You have to pick and choose and let your advisory committees make close decisions.

Q. Stan Brown, Head, Information Systems Department, AT&T

I would like to make a brief comment and maybe some of the panelists would like to respond. I think this is a very exciting occasion because it is one of the first examples (maybe the first example) of a large gathering of people associated with a discipline (not computers or information) coming together and saying, "Information service and information management is not ancillary in our institutions, it is the whole ball game!"

A. Marjorie P. Wilson

I would like to comment on the issue of planning and the role of strategic planning. A lot of people have asked me over the years, "Why plan?" As some of you know, I was responsible for developing the management education programs for the AAMC and we emphasized strategic planning, what it was and how to do it. When I think about it as applied to and used in academic medical centers, and particularly medical schools, I think the greatest value is an educational outcome. The increased awareness, the identification of problems and issues and opportunities, of the people who become involved in the planning process, may be the most important outcome that one realizes.

I agree about the strategic outlook. Strategic planning should be differentiated from long-range planning. I think it is the responsibility of the leadership and the chief executive officer to have a strategic outlook, to select major changes in direction, major objectives. This is not to say that you can not use staff in planning, but I think the strategic thinking of the leadership is what makes the difference.

Q. Susan Abramowitz, Office of Planning, New York Hospital, Cornell Medical Center

I have been impressed by your descriptions of the processes you have created in your involvement with IAIMS and by some of the projects you have identified. But we all know that implementing social experiments is not easy and often not successful. I would like to know what difficulties you have encountered in this endeavor, and what words of wisdom you have to offer those of us who might be contemplating getting involved in similar projects. What are some things to avoid, or what are some things that you think are critical?

A. Naomi Broering

We have had a lot of fun, we have also had a few problems. We have had peaks and valleys. I think the critical thing is to keep involving people, to keep meeting with them, keep talking to each other, and keep finding ways of negotiating positions so that you can keep the project moving ahead and keep it on track. This can never come about through the efforts of just one individual, whatever leadership capability that individual might have. I think it has to come through a team effort and through people having a sense of dedication and a belief that at the end of the road there is going to be something in it for them. This is what has helped us a great deal at Georgetown.

Having support from the top is very critical. There have been instances when our Chancellor had to come before the group and remind us of our goals, and his goals, to keep us focused and on target.

The other critical factor to help you through problem periods is the hope of having resources to keep the project going. As you have successful or good experiences, publicize them and share them so that people see that something is happening. You have to keep working on developing future resources.

I would like to add a comment on the issue of priorities. At Georgetown our strategy has been to take those things that are already developed to a somewhat sophisticated level and work on expanding and extending those. It is very important to have something successful to show the medical center. You need something on which to build. Another strategy is to take another setting, which is small enough to cope with, and bring it up from stage 1; start moving it along so that you can measure what is happening and can demonstrate how much can be accomplished, starting from very little. Developing things you can demonstrate is extremely critical.

A. Majorie P. Wilson

I would like to support what Naomi has said. It was critical in our institution that our late Chancellor, Dr. Al Farmer, was behind this project. Al recognized its importance. He took a leadership role in publicizing it across the campus and in enlisting the cooperation of the various people, schools and hospitals. That was very important. We did a lot of personal contacting of people we wanted to tap to participate in the project.

I would also point out that the funding we received from the NLM, while extremely welcome, has been a small piece of what we have invested. We have kept track of our participation in the project on the campus. From the standpoint of time and effort, we have put in three hours for every hour funded.

We selected people to chair our Functional Advisory Groups who are highly respected in their areas. The Chairman of the Group on Research is Mordecai Blaustein, who is our Chairman of Physiology in the Medical School, a very distinguished investigator and highly respected faculty member. We selected the best people we could find to serve on those committees. James Reggia, whom many of you know for his interest in artificial intelligence, works not only on our campus in Neurology, but with faculty in the Department of Computer Sciences on the College Park campus. We tried to get people who were held in high regard for their expertise and leadership on campus.

It would probably pay to look at the literature on the diffusion of technology. The whole concept of opinion leaders and their influence on the future of any such project is quite important. It takes a lot of personal contacting, talking, following up, taking care, and attention to the nitty gritty to bring about a change process.

On the issue of resources, which Naomi brought up: I became very conscious, as we talked this morning, that we emphasized what having an IAIMS project has done in our institutions and I can not say too many good things about that. I realize these resources are limited and not every one will be so fortunate as to have such a project. This makes it terribly important for those of us who have been able to get these projects started, it is incumbent upon us, to be very open about our experiences and to share what we learn, our successes and our failures. We are trying to develop prototypes in such a way that they can be shared, not only within our own institutions, but transported to other institutions.

Moderator, William G. Cooper

I applaud that statement and thank you for making it. There are an increasing number of inquiries about what is happening with IAIMS prototype planning and development. It is good to know that you are all willing to be a resource to others.

A. Gerry Hendrickson

I would like to comment on the things that are important to make this kind of project go and what some of the problems are that we have encountered. I will quickly go over the things that make a project go because you've heard them from two other people: first is commitment at the top. In our case, there are three "tops" to contend with: the President of Presbyterian Hospital, the Vice President of the Health Sciences Division within Columbia, and the President of Columbia University as a whole. All three entities were planning for information management. The Health Sciences Division started last, and one of the things we had to do was catch up with our partners. We had to find out where they were and do those things that allowed us to build appropriate interfaces with our partners so that there were mutual alliances, mutual interdependences.

Second is committee leadership. We chose people whose stature on campus commanded respect. Rachael Goldstein-Anderson, Health Sciences Librarian, and Thomas Q. Morris, at that time Vice Dean of the Faculty of Medicine and now President of Presbyterian Hospital, co-chaired a key committee on User Needs.

Third is the breadth of involvement of individuals throughout the institutions. One of the features of a project like this is that it is consuming. It is so consuming of people and time that an institution can have few priorities of this sort, maybe only one. It has to be at that level, and anything at that level displaces other projects.

What are some of the problems? First, we set out to do some detailed long-range planning and that proved to be an elusive thing. Technology is changing, what users want changes, as they become more sophisticated and become more acquainted with what's available. As the price of devices change, what users feel they can do without changes. So setting long-range plans in place was an elusive thing. What we had to do was put a priority on thinking strategically and plan as best we could. A second problem was determining what the next step should be after planning. The planning in our institution, as in others, was conducted with so much fanfare, so much visibility, and so much participation, that when we came to deciding what to do next, i.e., which departments or entities to use as models, we ran up against more eager volunteers than models.

As each of us has decided where to put the priorities at the next step, we have used different strategies. You, Homer, were deliberately more low-keyed. You built consciously on what was strong. You instituted a process that was viewed as fair. We had a convenient hook. We had an institutional policy being formulated by a Columbia-wide task force which was thinking about problems of information management. They had designed a core of services which were to be centrally funded and managed. Our users were adamant in wanting services broadly available and broadly useful. So we had to do two things in our model. We had to strengthen the core by offering a core service to everyone, as well as test concepts in particular confined areas. Also, we had to continue planning and forging the necessary organizational bonds.

Moderator, William G. Cooper

One of our colleagues asked me at the break, "Where are the warts?" I guess that is a way of asking what the problems are. I want to look that gentleman in the eye and say, "I have asked the question." So give us the problems.

A. Gerry Hendrickson

I have two more problems. Regarding information as a resource to be managed centrally means that all of us need to look at our budgets and put a higher percentage of our resources into information management. That means tradeoffs. Threading through those tradeoffs in a way that is fair and in a way the institution can handle is an issue, if not a problem.

Also, a certain amount of centralized management is needed to insure the free, uninterrupted flow of information, the starting point for a decentralized research institution which stands behind strong individual researchers. Finding what needs to be managed centrally, and making it clear that central management supports a decentralized research base, is a problem.

Moderator: William G. Cooper

Homer, would you like to comment? First, the problems:

A. Homer Warner

Well, I have already mentioned some problems we have had and I am sure there will be more. Most of these have been people problems: most of them territorial boundaries which have been hard to cross. Let me share with you one little story, if I may.

One of the faculty runs a large genealogy file and was very generous at the outset in letting people come in and share that resource and build on it. He develop a query language called "Genesis," which is very nice for linking files and entering data and queuing files. He got more and more users. He now has about five major projects using that resource and he is only one of them. Well, things came to a head this spring when two of these projects fell behind and their managers became very disgruntled. They felt they were not getting their fair share of resources. Neither people resources for assistance nor the programming effort was slanted enough toward what they needed. They felt resources were going more towards other projects. And so, the Vice President turned that problem over to IAIMS to try to handle. It was a rats' nest.

That is when we got into the issue of authority structure. We had to decide, first, whether the University Medical Center really was going to have some centralized control over these resources and then, how to develop some facility in the long run which would prevent this kind of difficulty. People buy a disk or they buy another CPU for the system and think they have got rights to certain things. That is why I say IAIMS is going to be a broker in our setting. It will see that peoples' expectations do not get out of line with what is realistic. This faculty member really went beyond what he could deliver; he really was not setting up a service facility. He was setting up his own research and thought that he could get something in return for letting people have access to the files. Those are the very kinds of problems which I think we can anticipate happening over and over again.

We are trying to anticipate that, and that is why we have very few resources. The IAIMS will be primarily in charge of operating the network. But the nodes on the network will be the individual property of individuals, or departments, or colleges, or hospitals. They will operate those as they wish and only insofar as they interact with each other will we be concerned with them. I think the day of the computer center is gone. Computer hardware is becoming almost commonplace. We are stressing, in our setup, facilitating the interaction amongst users who independently develop the thing to do what they want it to do. It is an experiment. We have not done it yet, but we are very anxious to launch into it.

Q. Morris Hawkins

You have mentioned user problems and management problems. I am thinking of another kind of problem. The reports indicate that there may be some resistance from faculty, staff, etc., who are not that favorably disposed towards automation in the ways that we tend to want to push now. In your planning, do you anticipate, or have you anticipated this kind of problem? and if so, what strategies have you to resolve it?

A. Naomi Broering

I am going to ask a member of our Georgetown faculty, Dr. William Ayers, to help address this question. I think he can supply the faculty point of view. Let me say that when we had to make some decisions about projects, we had become so abstract that we really could not. As we thought about IAIMS, we felt that to really make it happen, you had to give the students and faculty something to put their hands on, to use. Yes, you need that academic information, recorded knowledge, coming in from the library, but it has to be useful in a working environment. You need the combination of the clinical question and the literature. It was on that basis that we made some of our early implementation decisions. As for people who are a bit reluctant: some people we had to just sort of throw over the cliff and forge ahead. Dr. Ayers can talk about it from the inside.

A. Dr. William R. Ayers, Associate Dean for Undergraduate Medical Education, Georgetown University School of Medicine

Thank you, Naomi. I think that we are blessed with more people than we can handle at the present time. But there is that core of disbelievers. I think Naomi hit the nail on the head when she said, "We are trying to do things for students and faculty that they already need rather than to create something new." By emphasizing that, most people in the medical center, having the need, are glad to be users of our system. I think it is as simple as that.

Q. Tom Lincoln, Chief, Clinical Information Systems, Los Angeles County Medical Center

Several panelists have emphasized the amount of resources that this project takes. Clearly it takes both volunteer resources from the faculty and some dedicated resources as well. I am thinking of time, particularly. I would be interested in some figures: how many people, or how much time you have spent on some of this. We have a sense of what was done in nine months, but not of how many people were doing it over that nine months. Could you address the question of how much it is reasonable to anticipate?

A. Marjorie P. Wilson

I would be glad to, and perhaps my colleagues, Jim Penrod and Cyril Feng, might want to comment, as well. Jim came on board in March as our Associate Vice Chancellor for Information Resources, and he has dedicated (he and I have argued about this) as much as one third of his time. I made a commitment as Principal Investigator. When I got into it, I thought, "What am I doing here? I've got no business becoming involved in projects like this in view of my heavy responsibilities as an operating person in the medical school." I was Senior Associate Dean before I became Acting Dean, and I now carry both of those jobs, and IAIMS is just one of a number of projects in which I am involved. But I committed 5% of my time on the contract and I know I easily devote closer to 10% to it. Of course, it is variable. Some weeks you are on the project every day of the week. Then you reach a certain point, other activities go in, and other folks do it.

We really tried to carefully estimate, as a part of our original proposal, just how much time and effort would go into it and translated that into dollars. As

I recall, our contribution was over $300,000. I think that is probably a pretty fair estimate of what we are contributing in kind, in the time of the faculty. Cyril and his staff at the library contribute a great deal. He has two or three associates; I have an administrative assistant who is probably contributing a third of her time, at least; and we have one full-time project assistant who is paid for through the contract.

Moderator: William G. Cooper

Any other estimates?

A. Homer Warner

We have one full-time person who is the administrative assistant on the project and a number of part-time people, but the majority of the effort is essentially volunteer effort. When people serve on the committees, they get interested. We have our Executive Committee and each member has a subcommittee which he/she chairs. My guess is that we're probably talking about five full-time equivalents.

Q. Robert Greenes
Harvard School of Public Health

Dr. Warner has talked about financing some of the IAIMS services. I would be interested in some other institution's view of this. In particular, how should library information retrieval services be funded in different contexts (patient care vs. research, for example)? Should these services be a part of the overhead of the institution, or should they be a pay-as-you-go kind of thing? We can not look to vendors to subsidize IAIMS once we are out of the development mode . . . or maybe we can: we can stay in development forever! . . . I just wonder if there are other perspectives.

A. Rachael Goldstein-Anderson

I can not say we have solved the problem, but the issue has been raised. We think that, within the overall information policy established for the University, we will define a core of services which it is appropriate for the University to provide, just as, up to this date, the University provides a core of library services, which appear to be free to the ultimate users. Of course, these services are not free. They carry a very high price tag. But the University has decided to support them to a certain extent. We have a committee which is starting to translate some of these policies into operational policies and procedures. We plan to proceed with IAIMS pilot implementation to study the use of these services, to watch the development of these policies in the university context, and then to derive appropriate policies for what should be charged back, how much, to whom, and for what.

A. Naomi Broering

At Georgetown we would like to keep library services as free as possible. We feel these services are a part of the educational experience we owe our students, residents and fellows, as well as a part of the support for the faculty. The library has a budget. Over the course of the last five years, more and more of the budget is going into computer and electronic services in many libraries. That means that something else has to go. We have decided that we will continue to charge for services when we have to go to an external service, to a vendor, to acquire the information. If it is information we provide in our IAIMS, we want to be able to keep that free. This will certainly be the case in the initial years, because we want to encourage, rather than to discourage, people. We don't want students to have to worry about whether they can afford to use miniMEDLINE or the online catalog.

Moderator: William G. Cooper

I promised a 1:00 p.m. adjournment. We are pretty well on target. I thank you for coming. Dr. Lindberg will adjourn the Symposium officially.

Donald A. B. Lindberg

I want to thank the presentors and the members of the audience for giving us such an informative session. Special thanks go to Dr. Cooper for orchestrating this event. I think we have learned a great deal. I want to assure you that it is the intention of our institution to continue its support for the IAIMS program and, we hope, to increase it. Lunch is inspiring us to depart quickly. So, again, thank you very much.

Appendix B

Major Georgetown University School of Medicine Affiliations

In the following affiliations, Georgetown faculty administer major educational programs which students, residents, and/or fellows are assigned in rotation.

Affiliation	Services
The Arlington Hospital 1701 North George Mason Drive Arlington, VA 22205	Anesthesia, Emergency Medicine, Medicine, OB/GYN, Pediatrics, Surgery, Renal Transplantation
Columbia Hospital for Women 2425 L Street, N.W. Washington, DC 20037	OB/GYN, Pediatrics
D.C. General Hospital 19th St. & Massachusetts Ave., S.E. Washington, DC 20003	Medicine, Ob/Gyn, Ophthalmology, Surgery
The Fairfax Hospital 3300 Gallows Road Falls Church, VA 22046	Anesthesia, Medicine, Ophthalmology, Pediatrics, Psychiatry, Surgery, (General and Orthopedic)
The Great Oaks Center 12001 Cherry Hill Road Silver Spring, MD 20904	Pediatrics
National Naval Medical Center (SOM) Bethesda, MD	Pathology, Psychiatry, Neurology, Dermatology, OB/GYN
Providence Hospital 1150 Varnum Street, N.E. Washington, DC 20017	Community Medicine
Sibley Memorial Hospital 5255 Loughboro Road, N.W. Washington, DC 20016	OB/GYN, Ophthalmology, Psychiatry, Surgery (General, Orthopedic and Urology)
Veterans Administrative Hospital 50 Irving Street, N.W. Washington, DC 20411	Medicine and Surgery
Walter Reed Army Medical Center Washington, DC 20012	Radiology Services, Nephrology

Other Georgetown University School of Medicine Affiliation Agreements

In these affiliations, teaching programs involving Georgetown faculty, students, residents, and/or fellows from a single service or department take place.

Affiliation	Services
Alexandria Health Department (SOM) 517 N. Saint Asaph Street Alexandria, VA 22314	Pediatrics

Arlington County, Department of Human Resources (SOM) 1000 N. Edison Street Arlington, VA 22207	Pediatrics
Armed Forces Institute of Pathology (SOM) Washington, DC 20306	Thoracic Surgery
Dewitt Army Hospital Fort Belvoir, VA	Pediatrics
Dwight David Eisenhower Army Medical Center Ft. Gordon, GA	
Eye Care, Inc./Ecole St. Vincent Program (Haiti)	
Fairfax County Health Department North Region, Fairfax County Health Dept. 4080 Chain Bridge Road Fairfax, VA 22030	Pediatrics
The George Washington University 901 23rd Street, N.W. Washington, DC 20037	Emergency Medicine
The George Washington University/ Children's Hospital National Medical Center 901 23rd Street, N.W. Washington, DC 20037	Surgery (ENT)
Greater Southeast Community Center for the Aging 3847 Branch Avenue, Suite 114 Hillcrest Heights, MD 20748	Community and Family Medicine
Greater Southeast Community Hospital 1310 Southern Avenue, S.E. Washington, DC 20032	Emergency Department
Howard University Hospital 2041 Georgia Avenue, N.W. Washington, DC 20060	Surgery (ENT)
Jefferson Memorial Hospital (SOM) 4600 King Street Alexandria, VA 22302	Pediatrics
Maryland County Department of Health Allergy (SOM) 2350 Research Boulevard Rockville, MD 20850	Pediatrics (Immunology)
Regional Institute for Children and Adolescents 15000 Broschart Road Rockville, MD 20850	Pediatrics

St. Joseph's Hospital and Medical Center 350 West Thomas Road P.O. Box 2071 Phoenix, AZ 85001	Pediatrics
Shady Grove Adventist Hospital 9901 Medical Center Drive Rockville, MD 20850	Pediatrics
Suburban Hospital 8600 Old Georgetown Road Bethesda, MD 20014	Surgery
University of Maryland Medical Systems (UMMS) (formerly MIEMMS) 22 South Greene Street Baltimore, MD 21201	Emergency Medicine
Veterans Administration Hospital (SOM) 50 Irving Street, N.W. Washington, DC 20411	Medicine and Surgery
Virgin Islands (Government of)	Oncology
Walter Reed Army Medical Center Washington, DC 20012	Radiology Services, Nephrology
Washington Center for Aging Services 2601 18th Street, N.E. Washington, DC 20018	Community Medicine
Washington Hospital Center 110 Irving Street, N.W. Washington, DC 20010	Surgery (ENT)

Georgetown University School of Nursing Affiliations

The School of Nursing uses the following sites for training programs in the undergraduate or graduate programs. Georgetown faculty accompany Georgetown students assigned to these affiliates.

Adams Morgan and Hunt Place (DHS)
2200 Champlain Street, N.W.
Washington, DC 20009

Alexandria Hospital
Alexandria, VA

All Souls Unitarian Church

Beverly Hospital
Beverly, MA

Birth Home, Inc. and
Martha Goetsch, MD
Portland, OR

Blue Bird Nursery School
Arlington, VA

Brownsville Community Health
Clinic Maternity Center
Brownsville, TX

Bunker Hill Elementary School

Camelot Hill
Arlington, VA

Capital Head Start, Inc.

Capitol Hill Hospital
Washington, DC

Carriage Hill of Arlington
Arlington, VA 22202

Carroll Manor Nursing Home
Hyattsville, MD

Catholic University of America
Washington, DC

Cedars of Lebanon
Miami, FL

Center for Christian
Social Ministries,
Johenning Baptist Center
Washington, DC

Chevy Chase Baptist
Church Children's Center
Washington, DC

Children's Hospital
National Medical Center
Washington, DC

Cities-In-Schools, Inc.
Adolescent Health Center
Washington, DC 20009

Clara Barton Center for Children
Bethesda, MD 20034

Collingswood Nursing Center
Rockville, MD

Columbia Hospital for Women
Washington, DC 20037

Columbia Senior Center
Washington, DC

Community of Caring
Adams Morgan and Hunt Place (DHS)

Community Health Foundation
Mann, WV

Community of Hope Health Services
Washington, DC 20000

Comsat

Concord Hospital and
Kenneth McKinney, MD
Concord, NH

District of Columbia
General Hospital
Washington, DC 20003

Department of Human
Resources (D.C. Government)
Washington, DC

Dumbarton Senior Citizens Center
Washington, DC

Department of Justice
Occupational Health/Physical
Fitness Program
Washington, DC

Fairfax County Agency on Aging
Fairfax, VA 22030

Family Birth Associates
Alexandria, VA 22314

Far Southeast Medical
Association, Inc.
Washington, DC

Federal Employees and Occupational Health
(FEOH)
Washington, DC

Fort Lincoln Elderly Housing

Friendship Terrace

George Washington University Hospital
Washington, DC 20037

Georgetown University Hospital

Georgetown Cooperative Nursery School

Greater Southeast Community Center for the
Aging
Hillcrest Heights, MD

Group Health Association, Inc.

Hebrew Home of Greater Washington
Rockville, MD

Holiday Park
Wheaton, MD 20906

Holy Cross Hospital
Silver Spring, MD

Holy Trinity Elementary School

Hospital for Sick Children of Washiington, DC

House of Ruth
Washington, DC

Hygeia Facilities Foundation
Whitesville, WV

Janney Extended Day Program

Jewish Community Center for Greater
Washington

Johns Hopkins Hospital
Baltimore, MD

Langley Air Force Base
Virginia 23665

Madison Activity Center
Arlington, VA

Manor Care Nursing Home
Arlington, VA

Medical Center of Vermont
Burlington, VT

Monroe Health Center

National Health Screening Council

National Lutheran Home for the Aged

Natural Day Care
Washington, DC

New River Health Association
Piney View, WV

OB/GYN Unlimited, Professional Association
Concord, NH

Our Lady's Hospital for Sick Children
Crumlin, Dublin, Ireland

Peninsula General Hospital Medical Center
Salisbury, MD 21281

Prince George's County Health Department
Prince George's County, MD

Prince George's County Housing Authority
Prince George's County, MD

Private Practice of Carol J. Smith, MD

Psychiatric Institute of Washington
Washington, DC

Rhodell Health Clinic
Rhodell, WV

Roosevelt for Senior Citizens

St. Ann's Elementary School

St. Elizabeth's Hospital

St. John's Child Development Center

St. John's Hospital
Springfield, IL

St. Mary's County Mental Health Clinic
St. Mary's County, MD

St. Mary's Elementary School
Alexandria, VA

Shady Grove Adventist Hospital
Rockville, MD

Sibley Memorial Hospital
Washington, DC 20016

Sinai Hospital
Baltimore, MD

S.O.M.E. (So Others Might Eat)

Southeast Neighborhood House

Suburban Hospital
Bethesda, MD 20014

The Washington Home
Washington, DC 20016

Theresa Home School

United States Air Force, Malcolm Grow Medical Center
Andrews Air Force Base
Washington, DC 20331

University of California
San Francisco, CA

University of Nuevo Leon
Nuevo Leon, Mexico

Veterans Administration Hospital
Washington, DC 20422

Virginia Mason Hospital
Seattle, WA

Visiting Nurses Association
Northern Virginia
Arlington, VA

Walter Reed Army Medical Center

Washington Hospital Center

Washington Urban League, Inc.

Wisconsin Avenue Nursing Home

Georgetown University School of Dentistry Affiliations

The School of Dentistry provides service and educational programs at the following institutions:

Children's Hospital National Medical Center
Washington, DC 20010

Department of Human Services
Washington, DC

S.O.M.E. (So Others Might Eat)
Washington, DC

Veterans Administration
Washington, DC

The School of Dentistry has collaborative admissions programs with the following schools:

Adelphi University
Long Island, NY

Brigham Young University
Provo, UT

Fairfield University College
Fairfield, CT

Lemoyne College
Dewitt, NY

Loyola College
Baltimore, MD

Montgomery College
Rockville, MD

Providence College
Providence, RI

St. Michael's College
Colchester, VT

Sienna College
Loundonville, NY

University of Scranton
Scranton, PA

Villanova University
Philadelphia, PA

Georgetown University Hospital Affiliations

Georgetown University Hospital provides training opportunities for allied health professionals from the following schools:

Hospital	Field of Affiliation
Boston University	Physical Medicine & Rehabilitation and Occupational Therapy
Catholic University	Nursing Department and Social Work
Daemen College	Physical Therapy
George Mason University	Nursing Department
Hannah Harrison Career School	Nursing Department
Howard University	Pharmacy, Physical Therapy & Radiation Therapy
Marymount College	Nursing Department
Montgomery Community College	Mental Health Program
Quinnipiac College	Physical Therapy
Prince George's Community College	Medical Records
Texas Woman's University	Physical Medicine & Rehabilitation
Tufts University	Occupational Therapy
University of Maryland	Physical Medicine & Rehabilitation and Medical Oncology
University of Pennsylvania	Occupational Therapy
University of Wisconsin-Milwaukee	Occupational Therapy
Virginia Commonwealth University	Social Work & Physical Therapy

Appendix C

List of Participants in the IAIMS Project

Naomi C. Broering, MLS, MA Principal Investigator	Medical Center Librarian Dahlgren Memorial Library
Matthew F. McNulty, Jr., Sc.D. Chancellor, The Medical Center	110 Kober-Cogan
Milton Corn, MD Dean	School of Medicine NW 104 Med-Dent Bldg.
Stanley P. Hazen, DDS Dean	School of Dentistry NW 103 Med-Dent Bldg.
Elizabeth M. Hughes, Ph.D. Dean	School of Nursing 131 St. Mary's
John F. Stapleton, MD Medical Director	Office of the Medical Director 1W Hospital
Charles O'Brien Hospital Administrator	Hospital Administration 1W Hospital
William R. Ayers, MD Assoc. Dean for Undergraduate Education	School of Medicine NE 115 Med-Dent Bldg.
Walter Bechtold, DDS Computer Consultant	Medical Center Library
Ada R. Davis, Ph.D. Director, Graduate Program	School of Nursing 120 St. Mary's
Harry M. Doukas, Ph.D. Assoc. Dean for Sponsored Research	Medical Center NE 120 Med-Dent Bldg.
James T. Howell, MD Planning Consultant	Chancellor's Office 314 Kober-Cogan
Charyl Kiger, MPH Asst. Adm. for Planning	University Hospital 1 Hospital
Henry L. McQueeney, Jr., MS Sr. Assoc. Administrator	University Hospital 1 Hospital
Pauline Mistry, MSc, MHA IAIMS Project Manager	Chancellor's Office 110 Kober-Cogan
John J. Greenbaum Assistant Chancellor	Chancellor's Office 110 Kober-Cogan
Helen E. Bagdoyan, MLS Asst. Librarian for Public Services	Dahlgren Memorial Library
Donald Segal, MBA Asst. Administrator for Systems	University Hospital G Hospital
Carl Caplan, DDS Asst. Dean for Clinical Affairs	School of Dentistry 111 Dental Clinic

Susan Anderson, MLS Head of Reference	Medical Center Library
George Andersson Controller	School of Medicine NE 114 Med-Dent
Joseph S. Beyel Director, Medical Center Development	Medical Center 320 Kober-Cogan
Patricia Breault Programmer	Medical Center Library
Charles L. Broring, DDS Chairman	Department of Pedodontics G-23 Dental School
Mary Sue Carlson, MA Teaching Assistant	School of Nursing MO-14 St. Mary's
John C. Cherniavsky, PhD Chairman, Computer Sciences	Medical Center 228 Reiss Science Bldg.
Stanley L. Cohan, M.D. Associate Professor, Neurology	University Hospital 1W Hospital
Michael R. Clemmer Associate Chancellor	Chancellor's Office 110 Kober-Cogan
Joseph A. Day, MS Director, Educational Media	Educational Media GM-4 Preclinical Science
Gregorio Delgado, MD Director, Gynecologic Oncology	Lombardi Cancer Center P Lombardi
Janet D. Donohue, EdD Assistant Professor	School of Nursing MO-8 St. Mary's
Anatoly Dritschilo, MD Director, Radiation Medicine	University Hospital LL Bles Bldg.
Robert R. Fitzgerald Asst. to Dean for Business & Finance	School of Dentistry NW 109 Med-Dent
Thomas J. Gietner Assoc. Administrator for Finance	University Hospital 1 Hospital
Faye Green, MLS Computer Librarian	Medical Center Library
Jay N. Greenberg, MD Asst. Prof. Hem/Oncol, Pediatrics	Lombardi Cancer Center P Lombardi
Robert J. Hartzman, MD Chief, Div. Immun/Oncol, Pediatrics	Lombardi Cancer Center 169 Lombardi
Lillian Kamal, MHSA, MS Administrator	Lombardi Cancer Center P Lombardi

Nancy H. Knight, MLS Computer Services Librarian	Medical Center Library
Kathleen M. Kozar Grants & Contracts Specialists	Sponsored Programs 2 Ryan Administration Bldg.
Robert H. Larson Programmer	Medical Center Library
Robert S. Ledley, DDS Professor	Physiology & Biophysics—M.C.B.D. LR-3 Preclinical Science
Lawrence S. Lilienfield, MD, PhD Chairman & Professor	Physiology & Biophysics 243 Basic Science
Donald J. Loritz, PhD Assistant Professor	Linguistics 475 I.C.C.
Doris Lyons Director	Sponsored Programs 2 Ryan Administration Bldg.
Nancy Muzeck Administrative Officer	Chancellor's Office 311 Kober-Cogan
John R. Neefe, MD Assoc. Prof of Med/Oncol Div.	Lombardi Cancer Center 435 P Lombardi
Sheila Nimmons Asst. to Assoc. Dean for Sponsored Research	Medical Center NE 117 Med-Dent Bldg.
David Niven Director, Hospital Information Systems	University Hospital S.C.C.C.
Desmond O'Doherty, MD Professor & Chairman, Neurology	University Hospital 1W Hospital
Elizabeth Ann Phillips, MSc, MA Asst. Prof Pediatrics, Div Immun Oncol	Lombardi Cancer Center S Lombardi
Samuel J. Potolicchio, Jr., MD Asst. Professor, Neurology	University Hospital 1W Hospital
John Potter, MD Director and Professor of Surgery	Lombardi Cancer Center P Lombardi
Charles E. Rackley, MD Professor and Chairman	Dept. of Medicine 2221 Hospital
James C. Rich, Jr. Coordinator, Facilities	Chancellor's Office 110 Kober-Cogan
John C. Rose, MD Vice Chancellor	Chancellor's Office 214 Kober-Cogan

Virginia Saba, EdD Asst. Professor Graduate Program	School of Nursing 139 St. Mary's
Karen Scarborough, MS, RDH Administrative Officer	Office of Clinical Affairs 111 Dental Clinic
Frank G. Standaert, MD Professor and Chairman	Dept. of Pharmacology NE 403-A Med-Dent
John Stippich Library Programmer/Analyst	Medical Center Library
Robert B. Wallace, MD Professor and Chairman	Dept. of Surgery P.C.C.C.
Paul V. Woolley, III, MD Chief, Div. Med. Oncol	Lombardi Cancer Center 415 Lombardi

Non-Georgetown University

Dennis J. Conroy Telecommunications Consultant	Coopers and Lybrand
J. Kirby Farrell Telecommunications Consultant	Coopers and Lybrand
John F. Kurtzke, MD Prof of Neurol & Comm & Family Med (Epidemology) and Chief of Neurology	Veterans Administration Hosp.
Frank A. Rose, LLD Chairman of the Board	University Associates Inc. Washington, DC
Mardi Osmond Vice President for Programs	University Associates
Frank J. Magliato President	Sigma Associates
Henry Tobey, PhD Environmental Psychologist	General Physics Corp.
Jim Olson Account Executive	AT&T Information Systems Washington, DC

Appendix D

IAIMS Executive Advisory Board

Frank A. Rose, LL.D., Chairman
Chairman of the Board
University Associates

Robert J. Casale
Executive Vice President
AT&T Information Systems

John J. Donovan, PhD
Professor of Management Science
Sloan School of Management
Massachusetts Institute of Technology

Carl N. Edwards, M.Ed., Director
Four Oaks Institute

Joseph M. Fox, Chairman
Software Architecture & Engineering, Inc.

Charles Davis Haines, President
Public Welfare Foundation

John R. Hogness, M.D., President
Association of Academic Health Centers

Thomas J. Kennedy, Jr., M.D., Director
Department of Policy & Development
Association of American Medical Colleges

Leonard H. Marks, Esq.
Cohn & Marks

Davis B. McCarn, President
Online Information International, Inc.

Peter P. Muirhead, Ph.D., Project Director
Council of Great City Schools

Roger D. Semerad
Executive Vice President for External Affairs
The Brookings Institute

Luther L. Terry, M.D.
Senior Consultant
University Associates, Inc.

Appendix E

GEORGETOWN UNIVERSITY MEDICAL CENTER

Integrated Academic Information Management System (IAIMS)

Executive Advisory Board Meeting

Medical Dental Building, 201 N.E.
Executive Faculty Conference Room

Wednesday, November 30, 1983
10:30 a.m.–2:30 p.m.

Executive Advisory Board

Frank A. Rose, LL.D., Chairman
Robert J. Casale
John J. Donovan, Ph.D.
Carl N. Edwards
Joseph M. Fox
Charles Davis Haines
John R. Hogness, M.D.
Thomas J. Kennedy, Jr., M.D.
Leonard H. Marks, Esq.
Davis B. McCarn
Peter P. Muirhead, Ph.D.
Roger D. Semerad
Luther L. Terry, M.D.

National Library of Medicine Guest Speakers

William G. Cooper, Ph.D.
Associate Director for Planning & Acting
Associate Director for Extramural Programs

Martin M. Cummings, M.D.
Director Emeritus

Georgetown University Project Administrators

Matthew F. McNulty, Jr., Sc.D.
Chancellor, The Medical Center

Naomi C. Broering, MLS, MA
Medical Center Librarian

Stanley P. Hazen, D.D.S.
Dean, School of Dentistry

John B. Henry, M.D.
Dean, School of Medicine

Elizabeth M. Hughes, Ph.D.
Dean, School of Nursing

Charles M. O'Brien, Jr., M.B.A.
Hospital Administrator

Milton Corn, M.D.
Vice-Chairman, Dept. of Medicine

Lawrence S. Lilienfield, MD, PhD
Chairman, Dept. of Physiology & Biophysics

John F. Potter, M.D., Director
Lombardi Cancer Center

Charles E. Rackley, M.D., *Chairman*
Department of Medicine

Frank G. Standaert, M.D., *Chairman*
Department of Pharmacology

Robert B. Wallace, M.D., *Chairman*
Department of Surgery

John F. Stapleton, M.D.
Medical Director, Hospital

Consultants

Jose-Marie Griffiths, Ph.D.
King Research, Inc.

Mardi A. Osman
University Associates, Inc.

Program

10:30–10:45 **Welcome to Georgetown and Background on the Medical Center and the Long-Range Plan**
Matthew F. McNulty, Jr., Sc.D.
Chancellor, The Medical Center

10:45–11:00 **IAIMS Award and Introductory Remarks**
Frank A. Rose, LL.D., *Chairman of the Board*
University Associates, Inc.

11:00–11:30 **IAIMS, A Project Sponsored by the National Library of Medicine**
William G. Cooper, Ph.D.
Associate Director for Planning & Acting Associate Director for Extramural Programs
National Library of Medicine

11:30–12:00 **IAIMS at Georgetown University**
Naomi C. Broering, MLS, MA
Medical Center Librarian

12:00–1:00 Lunch

1:00–1:30 **PANEL: Health Sciences & The Information Age**

Information Management in the Health Sciences: Challenges and Opportunities
Carl N. Edwards, M.Ed., *Director*
Four Oaks Institute

Perceptions of IAIMS in the Future
Martin M. Cummings, M.D., *Director Emeritus*
National Library of Medicine

1:30–2:00 **PRESENTATION: The New World**
John J. Donovan, Ph.D.
Professor of Management Science
Sloan School of Management
Massachusetts Institute of Technology

2:00–2:20 **Discussion**

2:20–2:30 **Closing Remarks**—Dr. Frank Rose

IAIMS Development Team

Naomi C. Broering, MLS, MA, Chairman
William R. Ayers, M.D.
Walter Bechtold, D.D.S.
Ada R. Davis, Ph.D.
Harry M. Doukas, Ph.D.
James T. Howell, M.D.
Charyl A. Kiger, M.P.H.
Henry L. McQueeney, Jr., M.H.A.
Pauline Mistry, MSc, MHA
Robert J. Taylor, D.D.S.

IAIMS Operational Teams

Financial
John L. Greenbaum, M.B.A., Chairman

Information
Helen E. Bagdoyan, M.L.S., Chairman

Technical
Donald Segal, M.B.A., Chairman

GEORGETOWN UNIVERSITY MEDICAL CENTER

Integrated Academic Information Management System (IAIMS)

Executive Advisory Board Meeting

Riggs Library
Third Floor, Healy Building

Friday, March 9, 1984
10:00 a.m.–2:30 p.m.

Executive Advisory Board

Frank A. Rose, LL.D., Chairman
Robert J. Casale
John J. Donovan, Ph.D.
Carl N. Edwards
Joseph M. Fox
Charles Davis Haines
John R. Hogness, M.D.
Thomas J. Kennedy, Jr., M.D.
Leonard H. Marks, Esq.
Davis B. McCarn
Peter P. Muirhead, Ph.D.
Roger D. Semerad
Luther L. Terry, M.D.

Featured Speakers

John A.D. Cooper, MD, PhD
President, Association of
American Medical Colleges

Nina W. Matheson
Special Expert Consultant, Planning Office
National Library of Medicine

Robert J. Casale
President
Division of Marketing & Sales
American Telephone & Telegraph

John R. Hogness, M.D.
President, Association of Academic Health Centers

Davis B. McCarn
President, Online International, Inc.

Special Guests

Rev. Timothy S. Healy, S.J.
President
Georgetown University

William G. Cooper, Ph.D.
Associate Director for Planning & Acting
Associate Director for Extramural Programs
National Library of Medicine

Susan Buyer
Senior Program Analyst
Planning Office
National Library of Medicine

Georgetown University Project Administrators

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Chancellor, The Medical Center

Naomi C. Broering, MLS, MA
Medical Center Librarian

Stanley P. Hazen, D.D.S.
Dean, School of Dentistry

John B. Henry, M.D.
Dean, School of Medicine

Elizabeth M. Hughes, Ph.D.
Dean, School of Nursing

Charles M. O'Brien, Jr., M.B.A.
Hospital Administrator

John F. Stapleton, M.D.
Medical Director, Hospital

Program

9:30–10:00	Coffee in the Library Foyer
10:00–10:30	**Welcoming Remarks** Frank A. Rose, LL.D., *Chairman of the Board* *University Associates, Inc.* Matthew F. McNulty, Jr., Sc.D. *Chancellor, The Medical Center* **Progress Report and Current Project Activities** Naomi C. Broering, MLS, MA *Medical Center Librarian*
10:30–11:00	**IAIMS Impact on the Health Sciences** John A.D. Cooper, MD, PhD, *President* *Association of American Medical Colleges*
11:00–11:30	Discussants: Continuing Education of Physicians and Other Health Care Professionals John R. Hogness, M.D., *President* *Association of Academic Health Centers* Information Access Nina W. Matheson, *Special Expert Consultant* *Planning Office, National Library of Medicine*
11:30–12:00	Discussion Executive Advisory Board
12:00–1:15	Luncheon
1:15–2:00	**New Technologies and Advanced Systems** Robert J. Casale, *President* *Division of Marketing and Sales* *American Telephone & Telegraph* Discussant: Some Observations and Thoughts on Technical Issues Davis B. McCarn, *President* *Online International, Inc.*
2:00–2:30	**Discussion: Future Directions for IAIMS at Georgetown** Executive Advisory Board
2:30	Adjournment

IAIMS Development Team

Naomi C. Broering, MLS, MA, *Chairman*
Medical Center Librarian

William R. Ayers, M.D.
Associate Dean for Undergraduate Medical Education

Walter Bechtold, D.D.S.
Medical Center Computer Consultant

Carl M. Caplan, DDS, MBA
Assistant Dean for Clinical Affairs, Dental School

Ada R. Davis, Ph.D.
Director, Nursing School Graduate Program

Harry M. Doukas, Ph.D.
Assistant Dean for Medical Center Research

James T. Howell, M.D.
Director, Medical Center Planning

Charyl A. Kiger, M.P.H.
Assistant Administrator, Hospital Planning

Henry L. McQueeney, Jr., M.H.A.
Senior Associate Hospital Administrator

Pauline Mistry, MSc, MHA
Associate Director, Medical Center Planning

Robert J. Taylor, D.D.S.
Executive Associate Dean, Dental School

IAIMS Operational Teams

Financial—John L. Greenbaum, M.B.A., Chairman
Assistant Chancellor for Medical Center Finance and Business

Information—Helen E. Bagdoyan, M.L.S., Chairman
Assistant Medical Center Librarian for Public Information Services

Planning—Frank J. Magliato, Chairman
President, Sigma Associates

Technical—Donald Segal, M.B.A., Chairman
Director, Hospital Management and Computer Systems

Consultants

Frank J. Magliato
President, Sigma Associates

Richard J. Glasgow, M.S.
Vice President, Sigma Associates

Mardi A. Osman
Vice President for Programs, University Associates, Inc.

GEORGETOWN UNIVERSITY MEDICAL CENTER

Integrated Academic Information Management System (IAIMS)

Executive Advisory Board Meeting

Executive Faculty Conference Room
Medical-Dental Building

Thursday, October 25, 1984
10:00 a.m.–2:00 p.m.

Executive Advisory Board

Frank A. Rose, Chairman
Robert J. Casale
John J. Donovan, Ph.D.
Carl N. Edwards
Joseph M. Fox
Charles Davis Haines
John R. Hogness, M.D.
Thomas J. Kennedy, Jr., M.D.
Leonard H. Marks, Esq.
Davis B. McCarn
Peter P. Muirhead, Ph.D.
Roger D. Semerad
Luther L. Terry, M.D.

National Library of Medicine Participants

Donald A.B. Lindberg, M.D.
Director

William G. Cooper, Ph.D.
Associate Director
Extramural Programs

Richard West
IAIMS Program Officer
Extramural Programs

Georgetown University Project Administrators

Matthew F. McNulty, Jr., Sc.D.
Chancellor, The Medical Center

Naomi C. Broering, MLS, MA
Medical Center Librarian

Stanley P. Hazen, D.D.S.
Dean, School of Dentistry

John F. Stapleton, M.D.
Acting Dean, School of Medicine

Elizabeth M. Hughes, Ph.D.
Dean, School of Nursing

Charles M. O'Brien, Jr., M.B.A.
Hospital Administrator

Milton Corn, M.D.
Acting Medical Director, Hospital

Program

10:00 **Welcoming Remarks**
Matthew F. McNulty, Jr., Sc.D.
Chancellor of The Medical Center

Frank A. Rose, *Chairman*
IAIMS Executive Advisory Board

10:30 **Getting From Here to There: The Implementation Process**
Naomi C. Broering, MLS, MA
Medical Center Librarian

10:50 **A Peek Into the Future**
IAIMS and Education:
Graduate Medical Education
Milton Corn, M.D.
Acting Hospital Medical Director

Undergraduate Medical Education
William R. Ayers, M.D.
Associate Dean
Undergraduate Medical Education

Nursing Education
Ada R. Davis, Ph.D., Director
Nursing School Graduate Program

Dental Education
Carl M. Caplan, DDS, MBA
Assistant Dean for Clinical Affairs
The Dental School

IAIMS and Patient Care:
Neuroscience As A Model
Desmond S. O'Doherty, M.D.
Professor and Chairman
Neurology Department

Interface with Hospital Information Systems
Donald Segal, M.B.A., *Director*
Hospital Management and Computer Systems

12:15 **Luncheon**

12:45 **Medical Informatics and IAIMS: New Technology vs. Old Organizations**

Luncheon Speaker:
Donald A.B. Lindberg, M.D.
Director, National Library of Medicine

1:15 **Discussion**
IAIMS Executive Advisory Board

1:45 **Closing Remarks**
Frank A. Rose

2:00 **Adjournment**

IAIMS Development Team

Naomi C. Broering, MLS, MA, Chairman
William R. Ayers, M.D.
Walter Bechtold, D.D.S.
Ada R. Davis, Ph.D.
Harry M. Doukas, Ph.D.
James T. Howell, M.D.
Charyl A. Kiger, M.P.H.
Henry L. McQueeney, Jr., M.H.A.
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John L. Greenbaum, M.B.A., Chairman

Information
Helen E. Bagdoyan, M.L.S., Chairman

Planning
Frank J. Magliato, Chairman

Technical
Donald Segal, M.B.A., Chairman

Consultants

Frank A. Rose
Chairman of the Board
University Associates

Mardi A. Osman
Vice President for Programs
University Associates

Frank J. Magliato
President
Sigma Associates

Appendix F

1789

The Medical Center Librarian
Georgetown University
cordially invites you
to attend
Micro Day
Continuous demonstrations of
microcomputers and software
for
Health Professionals
Wednesday, May 9, 1984
10 a.m.–6 p.m.
Dahlgren Memorial Library
A detailed schedule will follow.

R.S.V.P.
625-5224

Raffle

Micro Day Demonstrations
May 9, 1984

AMA/NET **Station 1**	User-friendly access to biomedical bibliographic databases, electronic mail, CME bulletin boards, full-text online including AMA Drug Evaluations *Demonstrator: Michael Grelis*
AT&T **Station 3**	Preview of AT&T Information Services' "3B" microcomputer. *Demonstrator: Karen Joe*
BIOSIS/BITS and BioSUPERFILE **Station 7**	User-friendly access to biomedical databases; personal information system. *Demonstrator: Arthur Elias*
BRS/Medical Colleague **Station 6**	User-friendly access to biomedical bibliographic databases; full-text data online including over 23 major medical textbooks. *Demonstrator: Steve Ifshin*
CAS Online **Station 5**	User-friendly access to biomedical bibliographic databases. *Demonstrator: John White*
Frederick Computer **Station 10**	Microcomputer hardware and peripherals, including IBM, Texas Instruments and Apple products. *Demonstrator: Steve Carter*
ISI Sci-Mate **Station 8**	User-friendly access to biomedical bibliographic databases; personal information system. *Demonstrator: Barbara H. Stewart*
Library Computer Information Service **Station 9**	Software available in the Dahlgren Library, including INTERNIST, a computer-aided diagnosis program. *Demonstrator: Nancy Knight*
MEDACCOUNT **Station 13**	Office automation system for the practicing physician. *Demonstrator: Don Crimmins*
MEDICOMP **Station 4**	Clinical diagnosis system. *Demonstrator: Peter S. Goltra (AM only)*
NLM Videodisc/Apple **Station 11**	Interactive programs in pathology and radiology. *Demonstrator: James Woods (AM only)*
Radio Shack **Station 12**	Popular microcomputer products for the home and office. *Demonstrator: Andy Bridge*
SDC Searchmaster **Station 2**	Current awareness service designed specifically for researchers. *Demonstrator: Helen Bell*

Appendix G

List of Institutions Provided with Georgetown's IAIMS Planning Information

Academic Health Science Centers

Cornell University

University of Alabama, Birmingham

Tufts University

Johns Hopkins University

University of Iowa

Howard University

University of Tennessee

Hahnemann University

University of North Carolina

University of Oregon

University of Cincinnati

University of Maryland

Brown University

Associations and Other Institutions

Association of Academic Health Sciences Library Directors

American Library Association

National Library of Medicine

National Cancer Institute

Patient Care
Education
Academic Health Science Center
Management
Research

Volume 2: PLANNING ACCOMPLISHMENTS

Naomi C. Broering

Introduction 127
  Accomplishments 128
  Problems Encountered 136
  Research Questions 137
Conclusion 137
Appendix 138

Table of Contents

INTRODUCTION 127

ACCOMPLISHMENTS

ACTIVITY I: The Strategic Planning Process 128
ACTIVITY II: Institutional Self Study 131
ACTIVITY III: Development of an Implementation Plan 133

PROBLEMS ENCOUNTERED 136

RESEARCH QUESTIONS 137

CONCLUSION 137

APPENDIX
PLANNING RETREATS FOR IAIMS DEVELOPMENT TEAM AND REPRESENTATIVES FROM DEPARTMENTS ACTIVELY INVOLVED IN IAIMS 138

Summary of Planning Accomplishments

Patient Care
Education
Academic Health Science Center
Management
Research

Introduction

This narrative summary of the Georgetown University Medical Center (GUMC) strategic planning study leading to design of an institution-wide Integrated Academic Information Management System (IAIMS) covers the project accomplishments from September 26, 1983 to June 25, 1985. During this twenty-one month planning period, under contract with the National Library of Medicine, GUMC engaged in three major activities and accomplishments:

1) Implementation of a Strategic Planning Process for an IAIMS.
2) A Series of Institutional Self Studies.
3) Development of an Implementation Plan.

The overall goal of the project was to develop a ten year plan for an IAIMS that improves information flow and utilization of knowledge through an integrated system approach linking the Medical Center in an electronic network of computers and communications systems. To accomplish this goal each of the three major activities cited above included several objectives and tasks.

As reflected in the project outcomes, GUMC accomplished more than the contract requirements stipulated by the NLM. The IAIMS planning project served as a catalyst influencing and even accelerating decisions on several related activities of the entire University campus. During this period the University implemented its plans for a Telecommunications System with scheduled work to begin in the Fall of 1985. A campus-wide Computer Standards Committee was established to coordinate information system standards and policies of the three campus centers (the Law Center, Medical Center and Main Campus). Decisions were made to automate the Law and University Libraries; the Medical Center Library is already automated. And, electronic links were planned to provide the Medical Center units with access to the University's new accounting system. Since the three Georgetown campuses function semi-autonomously, these achievements represent rather momentous accomplishments in the direction of integration of information management.

The Medical Center, of course, experienced the greatest and most direct impact of IAIMS. The implementation plan outlines a ten year course of action to "pull together" diverse pieces of education, research, patient care and management information in a deliberate fashion. While experimentation with specific aspects of the IAIMS concept is expected in the early years, the recurring theme is directed toward integrating and interfacing systems to improve information flow.

The IAIMS planning activity certainly served a conscious raising purpose among the faculty, staff and students. It is apparent that attitudes changed considerably during the project period; more faculty joined the IAIMS planning teams, more faculty enrolled in the Library's computer courses and more departments began to acquire personal computers. Quite naturally, many departments began with office automation, but now more are moving from that stage to database development and personal information files. More faculty are using or developing computer-assisted-instruction for their students. There has been a noticeable increase in computer activity and everyone is eagerly awaiting the new opportunities IAIMS will present. It has been exciting to harness the enthusiasm of faculty and to direct it towards IAIMS.

The Medical Center periodically updates its long range plan covering a five year period. During this past year, all the Medical Center units (the Schools of Medicine, Dentistry, Nursing, University Hospital and the Medical Center Library) have been engaged in this activity concurrently with the IAIMS planning process. The long range plans under development cover the period from 1986 to 1990. Each unit has recognized the importance of effective information management by incorporating use of computers in the curriculums, in research and patient care and by including IAIMS related activities in their plans. The computer systems of the Medical School's faculty practice plan and the Dental School's clinic system, both externally based, are under review for restructuring and changes. The Nursing School, which currently uses office computing tools, plans to develop a nursing information system. All these units plan to interface with IAIMS.

Partially from natural growth and a need to expand, but also partially as a response to changing attitudes brought on by IAIMS, the hospital and library found it necessary to provide increased computer services. During the planning period, the hospital acquired a new IBM 4361 mainframe which is linked to its six other minicomputers. The library upgraded its computer system to a PDP 11/44 and recently acquired a VAX 785 system. Although it is recognized that core services will be needed for the Academic Information Management Center (AIMC), some demands have already emerged such as the need for more computer courses and consulting services. Both the Hospital and the Library's upgraded computers will accommodate IAIMS projects. A Local Area Network (LAN) will link these two primary sites.

The Medical Center's construction plans already includes design of communication links for computer systems. The new Clinical Sciences Building, Research Resources Facility and the proposed Institute of Neurosciences include nodes to the telecommunications system and the local area networks that are planned.

Certainly IAIMS has had a desired catalytic effect on GUMC. It has permeated current as well as visionary thinking, as evidenced by the long range plan of each unit. An integrated system is viewed as essential to the progress of the Medical Center in this next century, and the units have worked to assure that major decisions in the information field are well coordinated and structured in a unified manner.

Accomplishments

Activity 1: The Strategic Planning Process

The Strategic Planning Process consisted of seven objectives and twenty-two related tasks, including a series of immediate and long range steps to achieve the desired results. The purpose of this activity was to establish the general philosophy, conceptual framework, and logical approach for planning an IAIMS. To insure that the project was accomplished during the targeted period, a detailed calendar with sequential steps was developed.

During the project period this activity underwent constant refinement and expansion because new technological issues were introduced that needed to be addressed, such as the campus telecommunications system. Also, external factors beyond the institution's control required continuous updating of early work. These involved changing trends in technology and educational methodologies in the health professions field.

The objectives accomplished during this period included the following:

1. Organization of the Planning Leadership.
2. Involvement of the entire Medical Center.
3. Preparation of an Environmental Forecast.
4. Development of an Information Policy.
5. Modeling of Strategic Outcomes.
6. Development of Operational and Controlled Planning.
7. Establishment of Goals and a Timeframe for Policy Implementation.

To achieve these objectives it was necessary to organize planning teams, assign tasks and acquire resources. This included preparation of a detailed calendar to organize the project, to clearly identify specific tasks to be accomplished, to appoint individuals to perform the tasks, and to set the deadline dates for completion of the work. The calendar revealed the order in which some tasks would be undertaken as well as identified those isolated tasks that could be handled simultaneously. For example, the Self Study was undertaken immediately, but simultaneously the teams began work on the Environmental Forecast and the Information Policy issues. Obviously, there were major changes to the calendar during the project, but once organized, the basic guidelines and critical path for project responsibility and completion of the plan was followed.

Highlighted below are the achievements of Georgetown's planning process:

Organization and Planning Leadership

Because over 60 individuals were involved in the planning teams, it was necessary to arrange meeting schedules, develop team charges and assignments and convene numerous meetings to establish the planning procedures. Work with the two consulting groups was also arranged. The Development Team, chaired by the Principal Investigator, was designated as the project team responsible for creation of the IAIMS Plan. Arrangements were made to meet monthly, but in reality, this team met more frequently throughout the entire project period. Each Development Team meeting was attended by the chairmen of the four expert teams: the Technical Team, Planning Team, the Financial and Information Teams. Detailed minutes were prepared for each meeting which include a list of participants present and a summary of topics discussed. In addition to prepared agendas and minutes, a log of project documents was maintained including comprehensive records of meetings, events and activities relating to the total IAIMS project. These records were extremely useful for preparing progress reports.

The IAIMS teams were given specific tasks to perform relating to the varied aspects of the project. For example, the Development Team was assigned responsibility for preparation of the Ten Year Environmental Forecast at Georgetown, review of all IAIMS documents, and development of the Implementation Plan. The Technical Team was involved in identifying the technical needs and issues in connection with the Environmental Forecast, the Self-Study Survey, and the Technical Plan. The Financial Team oversaw the fiscal records including Georgetown's cost-sharing portion of the contract and development of fund raising activities. The Chancellor, the Chairman of the IAIMS Executive Advisory Board, the Principal Investigator and the Program Manager engaged in special consortial activities with other medical centers working on IAIMS planning. The Information Team was responsible for preparing the Information Policy, the Self-Study and a current bibliography of selected articles pertinent to IAIMS.

Two consulting groups participated in the project. One for technical assistance (Sigma Associates) and the other for leading the Executive Advisory Board functions and meetings (University Associates). The Technical consultants facilitated three major planning retreats and prepared the draft technical plan for the network architecture and system. In addition, they attended Development Team meetings for continuity and explored with several external firms appropriate means for designing the GUMC network.

The Chairman of the IAIMS Executive Advisory Board, a consultant from University Associates, convened and facilitated three major Board meetings. In addition, two other subcommittee meetings of the Board were called: one for educational issues and the other to review the draft technical plan. Board members were chosen for their prominence and expertise in the fields of health education, technology and planning. They are leaders from outstanding national organizations such as information systems corporations, academic, medical associations, nonprofit groups, and research institutions. They provided invaluable assistance during the planning project and served as advocates for Georgetown's goals.

Involvement of the Entire Medical Center

The Principal Investigator was responsible for involving the entire Medical Center in IAIMS planning through a number of activities. To launch the program initial publicity and presentations to faculty and staff were conducted at major meetings of the three Schools (Medicine, Dentistry and Nursing) and the University Hospital. The tasks included:

1. Distribution of initial publicity including press releases for Medical Center publications and handouts for faculty meetings. News items were printed in Georgetown publications such as The Record, The Examiner, GUMC Report and LOGIN.
2. Two types of presentations were conducted to inform faculty and staff, one for executive meetings and another for formal meetings which included slides. Over 30 presentations were conducted before the following groups:

School of Nursing:
  Executive Faculty, General Faculty
School of Medicine:
  Executive Faculty, General Faculty
School of Dentistry:
  Executive Faculty, General Faculty
University Hospital:
  Executive Administration Staff, Medical Staff
Medical Center Council:
  Monthly Reports
Executive Advisory Board:
  General Presentations
Student Councils of Medical and Dental Schools

In addition, at the November, 1983 Association of American Medical Colleges (AAMC) meeting, the Principal Investigator participated in an IAIMS panel sponsored by the Association of Academic Health Sciences Library Directors and, in October, 1984, a paper was presented at the NLM Symposium on IAIMS. Another presentation was made at the American Library Association meeting in Chicago on July 7, 1985.

3. Input from Faculty and Staff was encouraged. Chairmen and faculty of the major departments of the Medical Center were involved in IAIMS planning i.e. Departments of Medicine, Surgery, Pharmacology and Physiology and the Lombardi Cancer Center. Other departments joined later, such as Neurology, Anatomy and Pathology, as project ideas emerged. Throughout the planning period faculty were invited to join the IAIMS project teams and input was also requested during special interviews with departments. There was a constant recruitment of new volunteers for the IAIMS Teams during the project period.

Environmental Forecast

A draft Environmental Forecast was prepared by the Development Team early in the project period. This forecast highlighted: (1) Education; (2) Patient Care; (3) Research; (4) Management; (5) Information Access; and (6) Technical Issues. In reviewing the forecast, the members of the Development Team recommended that Georgetown University begin the IAIMS plan emphasizing academic aspects which coincide with the interests of the School of Medicine, Dentistry and Nursing, the Hospital and the Library. Skills for academic information problem solving were emphasized in the Pilot IAIMS Proposal submitted to the NLM. The environmental forecast was updated for final submission to the NLM in June, 1985.

Information Policy

The Information Team prepared a document highlighting Information Policy issues and these were discussed at length during the first off-site retreat. Debate was sharp, but everyone agreed that the issues identified were appropriate: Access, Confidentiality, Ownership, Quality Control, Security, Standardization, and Fees and Charges. The policy issues were based on an intensive search and analysis of the literature and on input from the Information Teams. After the retreat, a draft Information Policy was written and submitted to the Development Team. Each unit reviewed and offered revisions to the draft. The Information Policy was resubmitted to the units and to the Administrative Council of the Medical Center for final approval.

Modeling Strategic Outcomes

A brainstorming session at the first retreat focused on development of scenarios about a future IAIMS at Georgetown University. Speculation, broad but realistic, included futuristic workstations, access to databases from homes and dorms, conferencing between medical specialists, providing a network for continuing medical education and delivery of full text to end users. These ideas served as a basis for future strategic planning sessions and discussions. The most realistic scenarios were given priority in the plan.

Each unit of the Medical Center developed information flow charts which Sigma Associates used for sketching the architectural design for a network system. Options and alternatives were reviewed with the Development Team. At this point, it became evident that the University's forthcoming decision about a campus-wide telecommunications system would impact on IAIMS. Members of IAIMS and the Telecommunications Committee discussed critical points leading to consideration of IAIMS needs in design of the new system. The University contracted with a consulting firm for a report on possible options. Because a new telecommunications system will take time to install, the IAIMS architectural design included intermediary local area networks.

Development of Operational and Control Planning

This task was addressed with the establishment of the original planning teams. IAIMS was part of the GUMC infrastructure from the beginning. The leadership emanated from the Chancellor of the Medical Center. Each unit had representation on the IAIMS teams. The Principal Investigator handled the operational and fiscal efforts. A monthly reporting mechanism to the deans through the Medical Center Council was conducted and their recommendations were included in the plan.

Most of the operational and control efforts already in place will continue with minor refinements into the IAIMS era. However, it is recognized that changes brought about by rapid access to information through IAIMS may effect established operational and control mechanisms in the future. The current management control at GUMC includes financial, personnel, facilities and materials resources which are handled as follows:

1. Department Chairmen, including the Librarian, are required to submit any additional staff and faculty positions to their respective Deans for approval. The Librarian submits her requests directly to the Chancellor's Office. Before new positions are approved, department budgets are reviewed to determine if funds are available.

2. Facilities and materials maintenance are the responsibility of each unit. Major improvements require the Deans' and/or the Chancellor's approval. The purchasing department will not process them without approval.

These mechanisms will also apply for operational and control planning of IAIMS. An Academic Information Management Center (AIMC) for IAIMS will be established to serve as an administrative locus for core support and maintenance services. The IAIMS/AIMC, based as a function of the Library, will provide opportunities for economy of scale. Although staff, facilities and materials can be provided through some shared services, the IAIMS/AIMC will operate as an identifiable cost center with its own budget. The AIMC is the physical center responsible for operating the IAIMS system. Georgetown anticipates that the initial funding for the AIMC will be generated from external sources.

Establishment of Goals and a Timeframe for Policy Implementation

A schedule allowing for communication exchange on the recommended information policy was established and followed. It was agreed that as IAIMS projects are launched GUMC will commence implementation of the recommended policies. Naturally, some specific issues such as security are dependent on design of special software programs. In these cases implementation will follow appropriate design and testing of applications programs.

As policies become operational, their impact on daily functions will be carefully monitored so that any undesirable effects can be addressed as quickly as possible. The Medical Center Computer Committee agreed to follow policy issues and will make recommendations to the IAIMS Program Manager and Management Committee as needed.

Development of the Medical Center's information policy raised the question of future refinements of documents that served as guiding principles. These include the Faculty Handbook and standard administrative procedures of the University. It was agreed that as these documents change, IAIMS will incorporate appropriate changes to its operations. The Computer Committee will keep IAIMS management apprised of these areas.

Activity 2: Institutional Self Study

The Self Study activity consisted of two objectives and a series of nine tasks with the overall purpose of realistically examining Georgetown's technological resources and capabilities. The process was invaluable in identifying the Medical Center's strengths, weaknesses and areas with greatest potential for growth and development. To the extent possible existing resources will be utilized for building IAIMS. However, plans are to also take advantage of new technologies which will require upgrading and procurement of equipment and appropriate recruitment of skilled staff.

Among the major achievements of the self study were the assessed value of existing computer equipment owned by the Medical Center and a means for recording additional technological resources as they are acquired. An invaluable outcome was development of an online database of these resources that can be easily maintained and updated. During the planning year the database was updated twice.

The objectives accomplished during the self study included the following:

1. Assessment of technological capabilities of the Medical Center.
2. Identification of functional academic information management goals.

The findings of these tasks are reported in the Self Study Report. Summarized below are unique features and experiences of the Georgetown process.

Assessment of Technological Capabilities

During the project period the self study included a series of inventories. To accomplish the inventories two questionnaires were developed. The first, a brief one-page survey mailed to over 40 departments. The second, an interview questionnaire conducted through personal interviews by members of the information team. These results were recorded and analyzed to form the basis of the Self Study Report. During the interview process additional individuals with special interests and skills useful to the IAIMS project were recruited for the planning teams. Ideas were generated during the interviews for consideration by the Development Team. Information gathered during the inventories and interviews included:

1. Technological capabilities of the Libraries.
2. Use of computers and networking capabilities throughout the Medical Center (laboratories, departments and clinical areas).
3. Use of computers and word processors for manuscript preparation.

4. Interdepartmental, interinstitutional and intrainstitutional exchange of information electronically.
5. Human skills in computing and adaptability to information management problem solving.

As expected, because the Library and the University Hospital are automated, the survey revealed that there is heavy dependence on these information systems by Medical Center users. However, there are little or no connections to these systems from the other units. Other than a few departments with experimental lines linked to the library system, there is no interdepartmental access to any Georgetown University system. Other than the Hospital, there are no online mini-to-mini connections, and no micro-to-micro networks exist either. Only two departments are experimenting with internal micro network systems. (Pharmacology and Biochemistry). Numerous independent departmental/division databases exist and substantial growth is projected.

The survey and questionnaire revealed that the information flow in the Medical Center is on two levels:

- overall operational information; and
- academic information.

Although there are immediate plans to automate some departments, IAIMS is the only large-scale project that will link medical center information sources. There was significant interest and demand for a network system. Therefore, technical requirements for the network were reviewed during the study.

Functional Academic Information Management Goals

Georgetown's five basic operating units and the Chancellor's Office outlined information management needs and requirements for both short and long range planning. Information flow and unit goals were major agenda items during two of the planning retreats. A series of charts tracing information flow were developed. This task seemed cumbersome to the IAIMS participants largely because we are a paper based society unaccustomed to perceiving potential changes as electronic transmission becomes available. Nevertheless, some logical steps were taken initially using rough sketches which were gradually refined. In addition, Sigma Associates suggested an information summary form to assure that each unit adequately responded to the information flow requirements.

The charts served as the basis for discussion and brainstorming on long range goals. Each unit gained a sense of direction on how IAIMS complemented the need to harness information internally and to integrate with other sources. It was from these schematics that the units could clearly see which functions were their responsibility, such as integration of computers in the curriculum and enhancement of their own operational systems, and which were Medical Center IAIMS functions. A natural partnering for IAIMS related aspects occurred, and from this, criteria for selection of pilot projects emerged.

Each unit studied its present computer system and established goals for future development. Since much of this planning was accomplished during the IAIMS process, the units included many complementary features which are beneficial to the goals of IAIMS.

The strategic approach taken by GUMC for implementing IAIMS was developed from an analysis of the Self Study and the functional goals. These details are covered in the Implementation Plan.

Self Study Report

Two self study documents were prepared during the project period. The first preliminary report was submitted to the NLM on September 25, 1984. The second and final report is part of the Implementation Planning documents submitted on May 25, 1985.

The Self Study Report is an extensive document including the following detailed sections:

Environmental Forecast
Information Policy
Mission Statement
Inventory and Analysis of Technological Resources and Capabilities
Needs Assessment for Function Flow of Information
Information Use Scenarios
System Functional Requirements

The study includes numerous charts and illustrations of existing and proposed transfer of biomedical information throughout the Medical Center units. It formed the basis for technical design of the network system included in the Implementation Plan.

Selection of IAIMS Pilot Projects

The needs assessments originally conducted during the inventory interviews provided initial information for selection criteria and priority assignments of the programs to be implemented in the IAIMS project. As an outgrowth of this process, detailed interviews were conducted by the Principal Investigator and the IAIMS Program Manager to identify departments suitable for IAIMS model development. Those with the most need, greatest potential for success and applications that could meet the IAIMS concept were considered and reported to the Development Team. Technical and functional investigations needed in many of the departmental projects were also identified as potential areas for future research studies. These findings were merged into the Implementation Plan for logical sequence as IAIMS projects are launched.

Interviews of Medical Center Departments:

1.	Emergency Medicine	University Hospital
2.	Ambulatory Care	School of Medicine (Department of Medicine)
3.	Department of Pharmacology	Joint programs of the Schools of Medicine, Dentistry, Nursing
4.	Radiation Safety and Control	Medical Center
5.	Interdisciplinary Department for Oncology (Lombardi Cancer Center)	Joint programs of the Hospital, Schools of Medicine and Basic Science
6.	National Biomedical Research Foundation—Department of Physiology & Biophysics	Joint programs of Schools of Medicine and Dentistry
7.	The Dahlgren Memorial Library	Medical Center
8.	Department of Neurology	School of Medicine and Hospital
9.	Undergraduate and Graduate Nursing Education and Research	School of Nursing
10.	Radiology Department: Archival	School of Medicine and Hospital
11.	Clinical Pathology and Laboratories	Hospital
12.	Dental Clinic Program: Workstation Project	School of Dentistry

A keen interest in the IAIMS project was apparent during these interviews. Department Chairmen and their faculty were extremely enthusiastic. Numerous innovative and highly sophisticated projects are envisioned by several faculty members. In comparison to attitudes in the early 1980s, the enthusiasm demonstrated as a result of IAIMS is exhilerating and very encouraging. The greatest challenge to the IAIMS leadership is to harness this enthusiasm and direct it toward suitable projects that are beneficial to the entire Medical Center.

Activity 3: Development of an Implementation Plan

Unquestionably, this was the most challenging, thought provoking, and time consuming task of the entire project. The accomplishments are the culmination of an almost two year effort of gathering information on the best approach of developing an IAIMS at Georgetown. It required absorbing and digesting an immense amount of information and finding the most suitable strategy for mapping Georgetown's future course of action.

This third activity, development of the implementation plan, involved seven objectives and over twenty tasks. The plan describes what Georgetown expects to accomplish in implementing IAIMS, how it will be conducted and how the goals will be achieved. The objectives accomplished were to:

1. Develop institutional information resource management policies.
2. Determine functional responsibilities of database managers.
3. Organize management of the IAIMS network.
4. Design the Implementation Plan.
5. Ascertain resource requirements for IAIMS.
6. Plan project leadership and Implementation Teams.
7. Establish evaluation mechanisms for measuring achievements.

To achieve these objectives the Development Team engaged in numerous information gathering activities. The technical consultants provided tutorial sessions, the Information Team provided the latest literature on information technologies, policy and managerial issues, and AT&T sponsored two seminars on information management. The first was conducted by a team from the University of Pittsburgh that is developing their "campus of the future." The second, on Information Management Systems, was conducted at Calloway Gardens, Georgia by AT&T information specialists. When the planning efforts began, none of the Georgetown participants had previous experience in this type of endeavor. There was no established network system which meant planning teams were beginning at the very first step and there was no precedent from which to gain knowledge. Because of this, the Georgetown plan covers a broad spectrum of activities with multifaceted aspects for IAIMS development.

The plan was achieved as follows:

Development of Institutional Information Resources Management Policies

The strategic approach to planning IAIMS was determined during this activity. General guidelines and policy issues were determined. This was followed by the operational approach for a distributed system rather than a centralized approach. Technologies were considered in relation to those applications required and needed at Georgetown. To develop the network, the team selected the focal points for network nodes.

Information resources management policies were established after considerable debate and information gathering occurred during the retreats and attendance at seminars and conferences. The retreat agendas are outlined in Appendix A.

Determine Functional Responsibilities of Database Managers

Once it was decided to implement a distributed approach to IAIMS it naturally followed that the existing database managers would assume responsibility for their areas of subject expertise. The Hospital systems staff agreed to develop clinical databases, the Library assumed responsibility for information and bilbiographic databases, the Schools of Medicine, Dentistry and Nursing assumed responsibility for educational and research databases. All the units require management data so it was agreed that while the Chancellor's Office required centralized management information, each unit also needed improved information management gathering systems.

Organize Management of the IAIMS Network

Planning for IAIMS has generated a multi-disciplinary approach to information transfer. While some organizational restructuring is required to implement the system, it is being accomplished in a cooperative team approach with essentially no disruption to the existing computer systems of the Medical Center units. The Development Team agreed that an individual at the Vice Chancellor level should be recruited to coordinate communications and information resources for the Medical Center. It was also agreed that the IAIMS Program Manager will be responsible for managing implementation and pilot projects. New staff with technical skills will be recruited and appointed for network management and software design.

The IAIMS Development Team will assume responsibilities of the IAIMS Management Committee. This committee, with representation from each unit of the Medical Center, will work cooperatively on implementing IAIMS and assuring its success. For details on Management, see the the section on Organization in the Implementation Plan.

Design the Implementation Plan

The implementation plan was developed cooperatively by dividing responsibilities. Technical network plans were designated to Sigma Associates with review by the Technical Team. Discussions and presentations were made to the Development Team where consensus was reached on the most suitable applications for Georgetown. Responsibility for IAIMS program planning was assumed by the Development Team. The interviews conducted by the Principal Investigator and the Program Manager were instrumental in helping the Team select programmatic approaches for the plan. Once reported and considered by the Development Team, selection and priorities were established.

Numerous meetings about the nature of the Implementation Plan were held that provided a baseline including process, procedures, key assumptions and architectural design for system requirements. Rough sketches, including phased plans for implementation, were reviewed by the teams at the second retreat on August 17, 1984. It was determined that three main phases will be planned: (1) Pilot, (2) Interim and, (3) Long Range IAIMS. Furthermore, all programs will be implemented as pilot projects to be tested and evaluated before being fully implemented. For strategic reasons it was agreed to begin by linking existing sophisticated systems that are already successful and operational, such as the Library and Hospital systems. Then, departments and units will be added in a logical progression beginning with a "clustering" approach.

For technical issues a draft Implementation Plan was submitted by Sigma to Georgetown on September 18, 1984 and it was jointly reviewed by a Technical Development Team. Georgetown used this document as a preliminary guideline for its final plan.

For programmatic aspects of the Implementation Plan the Georgetown Teams established two major goals to make information more accessible through IAIMS.

The First Goal—Academic Information Management: To improve the transfer of biomedical information and utilization of recorded knowledge in support of the programs of the Medical Center.

Objectives: To achieve this goal, four objectives address the ability to bring operational and academic information sources into useful conjunction and to maximize the utilization of the range of information technology systems and services including telecommunications, computers, image transmissions and office systems. The four objectives cover education, research, patient care and management issues.

The Second Goal—Excellence and a Prototype IAIMS: To become a "Center of Excellence," a prototype IAIMS, to serve as a national resource for other academic health science centers and other health related organizations and to engage in research and demonstrations on the use of advanced technologies in the health field.

Objectives: The outcomes of the four major objectives in this goal are intended to be beneficial to the nations's other medical centers as well. They include sharing information on applications programs, contributing to the accomplishments of medical informatics, sponsoring conferences on IAIMS and extending consortial activities with other academic health centers.

Operational Plans

Generally, the Medical Center adheres to a distributed system approach with decentralized operational functions linking through the LAN. The Academic Information Management Center (AIMC) will serve as a support service to the Medical Center units. The proposed computer laboratory will enable the schools to conduct academic computing functions at the AIMC. The Hospital will be responsible for clinical functions. Resource requirements include an IAIMS computer for the AIMC and distributed mini-microcomputers in a clustering approach in departments and units throughout the medical campus. Integration and interface plans are to identify areas within the network system where redundancy can be eliminated and where improved efficiency in transferring information can enhance the programs of the Medical Center. Databases suitable for global use will be developed and made available.

Ascertain Resource Requirements for IAIMS

There were two major aspects of resource rquirements considered in the Implementation Plan:

1. Preparation of budget estimates for ten years.
2. Identification of funding sources.

As mentioned in the Implementation Plan, IAIMS is a multimillion dollar project. The IAIMS activities are estimated at $10 million for the first five years, $8 million for the second five years, $8 million for construction and $10 million for Telecommunications.

The budget estimates, based on figures provided by Sigma Associates, were determined from the technical resources required to implement IAIMS. The Sigma Associates consultants met with communications and computer experts to project costs for the network and information systems. Staff needs were based on GUMC population and its service requirements.

Construction costs for a two floor addition to the library for the AIMC were based on architectural estimates by Georgetown University. Unfortunately, Georgetown was unable to undertake an external architectural study of the library because quotes submitted by two firms (over $25,000) were higher than available funds from the NLM contract. Since construction funds are not imminent, it was decided to concentrate on renovation plans for the initial years of IAIMS. Therefore, as part of the planning project for the AIMC, Georgetown prepared architectural plans to develop a computer classroom, a small computer laboratory, an open workstation area in the Audiovisual Learning Center and group study rooms on the ground floor of the library. The AIMC will function in this space for the early years until construction funds are identified.

Plan Project Leadership and Implementation Teams

Plans are to recruit an individual as Assistant Chancellor for Information Resources to coordinate computer and communications systems for the

Medical Center. One of the responsibilities of this person will be to participate in the IAIMS management committee. Recruitment has begun; however, resources for salary support have not yet been identified.

With the exception of new staff needed to conduct the implementation and operations of IAIMS, the majority of existing Development Team members will serve on the IAIMS Management Committee. The IAIMS Program Manager will coordinate and administer the projects. The existing functional managers of databases will become members of the implementation team.

During the implementation process new staff will be recruited for software design and development, technical operations and maintenance, AIMC support activities and instructional programs.

Establish Evaluation Mechanisms

Generally, it was agreed that a variety of aspects of IAIMS should be evaluated to determine success and progress of the program. Of major interest are:

1. Evaluation studies pertaining to behavorial and attitudinal aspects regarding use of computers and applications software. Acceptance of IAIMS services relates directly to the success or failure of a program.
2. Evaluation of system use includes utilization of databases, computers systems, the network system and the AIMC—the instructional and training center.
3. Means of measuring technology transfer and development of medical technology computing systems are of special interest in determining the application of aspects of IAIMS.
4. Use and design of software for support of education, patient care, research and management functions of the Medical Center is another area to be evaluated.

The purpose of these evaluative data is to identify the aspects of IAIMS that are most beneficial and suitable to the needs of Georgetown. This data would also be useful to other academic medical centers planning to develop IAIMS projects.

Problems Encountered

A few minor problems and adjustments were encountered. These changes were previously unforeseen items that could not be identified until the actual contract work was begun. However, the solutions resulted in major improvements that were beneficial to completion of the project.

Since the aim is to have the best possible IAIMS implementation plan, it became necessary to change the technical planning consultant and to add an administrative assistant to ease the unanticipated heavy workload. Other changes include increasing the membership of the planning teams to strenghten the project's expertise.

There were some attitudinal changes experienced by the planning participants during the twenty-one month project period. At first they were very interested in IAIMS but also obviously skeptical about the project. Some of the concerns focused on overall cost to the institution and also whether integration meant centralization with loss of autonomy. Nevertheless, the participants recognized the value of planning for future information management at the Medical Center and determined that it was a beneficial path to pursue. As the work progressed specific issues were raised involving organizational and managerial matters that seemed threatening to the existing automated operations of the units. These resulted in numerous discussions about the most suitable approach for Georgetown. There was consensus that to achieve success Georgetown should preserve its functional systems and build logical approaches to integration and interface with the developed databases and existing computer systems.

In addition, the planning teams weighed the pros and cons of centralized versus decentralized approaches to IAIMS. For technical as well as functional reasons, the most acceptable and logical means was to adapt a distributed system approach with development of a communications network that would accommodate unified access to the Medical Center's databases. Planning progressed very rapidly once this decision was reached.

At the midway point of the planning period, when it was apparent that some project ideas could become a reality, work proceeded in a very positive manner. Enthusiasm was high and effective planning was much easier. Innovative ideas that emerged during the planning retreats were considered as potential pilot projects.

What could have become a problem was successfully turned into a positive accomplishment. Today, momentum at Georgetown is great and IAIMS has become self-generating. There is enthusiastic interest among the faculty, staff and students, and the Medical Center stands poised to proceed with the pilot and research projects selected for early development and implementation.

Research Questions

Research issues raised during the planning period were related to questions about what aspects of IAIMS were most pertinent to Georgetown. Many of the questions asked could not be answered because of the newness of IAIMS. There has been little experience on the national scene with this effort, and there is no precedence established for dealing with the issues.

The research questions discussed at Georgetown focused on the following categories:

1. Human behavior—acceptance and system use.
2. Policy issues once a system is implemented, i.e. security, confidentiality, ownership and standardization.
3. Design of software systems most suitable for education, patient care, research, management and bibliographic functions.
4. Medical computing technology related to interface, integration, networking and design of workstations.

A variety of research issues are covered in the implementation plan in Section X, "Evaluation of IAIMS." Georgetown is seeking answers to research questions about the most relevant features of an IAIMS that are beneficial to users. The Lombardi Cancer Center project submitted to the NLM proposes the hypotheses that by improving the information management process on patient, research and bibliographic data, the outcome will lead to changes in information access and behavior by end-users, and consequently, improved medical decisions and patient care. This is one example of the type of research Georgetown is interested in conducting.

Conclusion

The planning project progressed quite smoothly and on schedule. All documents were submitted to the NLM in a timely fashion. On reflecting the accomplishments of the past 21 months, a great deal of work was achieved. Several issues and questions were addressed, and key decisions were reached about future management of information at Georgetown. A great deal of excitement about IAIMS was generated throughout the Medical Center. The IAIMS teams were encouraged by the support they received in virtually all circles of the Medical Center. The momentum and support throughout the Medical Center has filtered to the University's Main Campus through work with the Telecommunications Committee and through a seminar sponsored by AT&T. The NLM site visit gave additional visibility to the IAIMS projects and gave the planners a feeling of accomplishment.

It is hoped that through implementation of the Pilot IAIMS project, Medical Center users will begin to see a model created that will serve as a catalyst for continued stimulus and enthusiasm. The proposed research project will begin to address how an IAIMS is utilized and if it changes end-user behavior. It is believed that IAIMS can enhance patient care. These initial projects will provide data on aspects of an IAIMS that are suitable and relevant to Georgetown.

Other tasks, not directly related to the contract, were accomplished during the project period. For example, Georgetown participated in a NLM symposium on IAIMS on October 16-17, 1984 and many national and international visitors came to Georgetown for information exchanges on IAIMS and computer related systems in the health field. This visibility and opportunity to share ideas has been a positive by-product of the IAIMS planning project.

Appendix

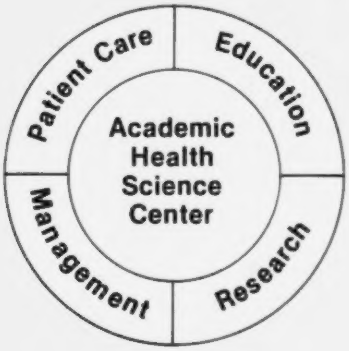
Planning Retreats for IAIMS Development Team and Representatives from Departments Actively Involved in IAIMS

To accomplish the work of Activity III, the Implementation Plan, it was important that goals, priorities and operational policies be appropriately identified and that a general consensus for the direction of IAIMS be reached. Most of the Development Team members and senior individuals contributing to these decisions engaged in brainstorming for strategic planning during three retreats. The purpose of the retreats were to reach consensus on the following issues:

A. First IAIMS Retreat Agenda:
   1. Information Policy drafted for GUMC by the Information Team.
   2. Modeling Strategic Outcomes of IAIMS for each of the Medical Center units (Schools of Medicine, Dentistry and Nursing, the University Hosptial and the Library).
   3. Assessing appropriate technologies for GUMC and considering the technological impact on the Medical Center.
   4. Establishing the basis for operational and control planning.

B. Second IAIMS Retreat Agenda:
   1. Review Information Policy to be submitted to the Medical Center Council.
   2. React to preliminary outline of the Implementation Plan.
   3. Consider the financial plan and phases for implementation.

C. Third IAIMS Retreat Agenda:
   1. Review draft of Technical Aspects of the Implementation Plan.
   2. Explore program content of IAIMS projects.
   3. Consider criteria for selection of pilot projects.
   4. Establish mechanism for writing the Implementation Plan.
   5. Review grant and fund raising projects.


Patient Care
Education
Academic Health Science Center
Management
Research

Volume 3: ENVIRONMENTAL FORECAST

Pauline Mistry

Introduction 143
Patient Care 144
Education 146
Research 147
Management 148
Information Access 149
Technology 150
Conclusion 151
Bibliography 152

Table of Contents

INTRODUCTION 143

PATIENT CARE 144
Financing
Organization
Technology
Consumer Expectations

EDUCATION 146
Professional:
  Medicine
  Dentistry
  Nursing
Graduate:
  Master's
  Doctoral
Residency/Fellowship
Continuing

RESEARCH 147
Funding Patterns
Corporate Entities
Product-Oriented Research
Technological Advances

MANAGEMENT 148
Prospective Payment
DRG
Competition
Health Care Delivery
Information Demands

INFORMATION ACCESS 149
Online Systems
Training
Database Development
Computer Laboratory
Consulting Services

TECHNOLOGY 150
Communications
Hardware
Software

CONCLUSION 151

BIBLIOGRAPHY 152

Environmental Forecast

Patient Care
Education
Academic Health Science Center
Management
Research

Introduction

The development of a ten-year Environmental Forecast for an academic health sciences center, such as the Georgetown University Medical Center, is a complex process which must take into account the basic functions of patient care, education, research and management and relate these to forecasted developments in technology and communications and to external social and economic factors. In recent years, advances in technology have had a major impact on patient care in several areas. Although there will always be some 'lag-time' involved, such changes must have an effect on educational and research programs and on organizational management. Despite these technological advances in patient care, the health professions in general have been somewhat late in applying high technology, reluctant to employ computers as communications devices and delinquent in setting up databases. Yet the health professions are deluged by paper work from federal agencies, insurance companies, and employers and are inundated by information from new research developments and scientific articles. Accordingly, the components of academic health science centers which involve education, research, patient care and institutional management will be increasingly subject to the application of technological advances to operate, communicate and plan more efficiently and effectively to satisfy professional and business objectives.

Various health professionals, while driven by learning and knowledge pursuits to accept improved management techniques, will also be forced by corporate reorganizational activities to use automated approaches to control escalating costs, competitive market shares and high quality performance. Stronger management resources because of capital access, commercial know-how, strategic planning and large organizational behavior will press detailed systems to use among health professionals.

Just a few years ago it seemed that health care resources in a wealthy country would be limitless for the relief of suffering Americans. The rapid increase in health care costs in the past decade, however, make it clear that our country is now facing the challenge that medical care is finite; we cannot afford every new development, even in life-threatening situations. More emphasis in the future will be on cost effectiveness of treatment modalities and, in this situation of limited resources, it will be necessary to establish priorities. When economic pressures and demand requirements tighten the performance in health services delivery, the scheduling of resources will become crucial aspects to master. The computer and ordered systems, then, present the tools with which we may use our expensive resources efficiently and mathematical models become the quantitative counterparts of high quality performance. With all the automation, analytical applications and technological innovations, the health care field will be striving to keep the close personal touch between patient and practitioner. The health care environment of the future will be a struggle between maintaining an intimately personal relationship among the involved people and the need to harness the technology which promises an optimal use of resources.

Patient Care

FINANCING
ORGANIZATION
TECHNOLOGY
CONSUMER EXPECTATIONS

The decade of the 1980s will witness multiple changes in patient care in the areas of financing, organization, technology and general consumer expectations. Of immediate concern is the reduction of federal govenment support for health care programs which will force hospitals to assess the impact of reduced support on programs, strategies, finances, organization and human resources.

Social and demographic changes in the patient population will also impact on hospital programs and services. The portion of the United States population over the age of 65 will continue to rise with particularly rapid increases in the number of persons over age 75. This factor may be expected to increase hospital utilization, total expenditures and particularly expenditures that have historically been covered by government programs such as Medicare and Medicaid. An aging population will also mean an increase in the need for long-term care which may cause hospitals to reassess their role in providing services in this area.

As public interest in and knowledge of health care issues and health care costs increases, individuals are likely to seek a greater degree of participation in decisions which affect their health and the costs of health care services. Hospitals will need to increase their attention to the changing needs in their own communities and the role of the hospital in meeting those needs. The development of new hospital services and/or the expansion of cooperative relationships among hospitals and other health care facilities are likely to be viewed in a positive way by the community.

Hospitals will be under increasing pressure related to the addition of capital intensive technology. Three primary sources of pressure will be public expectations of receiving the latest and the most advanced modes of treatment; the need to keep up with current industry standards of care, as defined at least by the hospital's legal liability to maintain standards; and the need to contain costs and comply with increasingly stringent regulations in this area. Changes in clinical practice patterns and utilization as a result of new technology must be anticipated and analyzed. As the level of technology increases, a greater emphasis will be placed on sharing of highly specialized equipment among facilities to ensure the economic feasibility of its use.

Computers have already revolutionized many areas of diagnosis and treatment. Computer technology has led to the development of computerized axial tomography, nuclear magnetic resonance, digital vascular imaging, other digitized imaging systems, cardiac catheterization equipment and other examples. It is anticipated that as computer systems become more advanced, new applications will be developed in non-invasive diagnosis and treatment. A greater number of procedures will be performed on an outpatient basis, resulting in decreased admissions and shortened length of stay for those patients who are admitted. At the same time, capital investment in technologically advanced equipment will be very significant.

The development of online clinical databases will also have an impact on medical diagnosis. A clinician will have the capability of accessing, via computer terminal, records of patients with similar medical conditions to examine treatment modalities and outcomes. This information may then be helpful in medical management and decision making for patients currently under treatment.

In ancillary medical services, computerization has made possible the ordering of tests, mechanized performance of many laboratory tests, reporting of results directly to patient care units, and vastly improved filing and retrieval systems. Each of these applications and others, which will develop over time, have improved the efficiency, speed and in some cases accuracy of ancillary service delivery. It is anticipated that future developments will continue to have a positive impact on these areas in a manner which will, in the long run, reduce costs and improve results.

In each of these areas improvements in medical care and efficiency in delivering that care will assist hospitals in becoming more economically responsive and is consistent with pressures to contain the rate of growth in health care expenses. It will also allow institutions to become more responsive to the social and political concerns which exist in the health care environment.

Currently, the utilization of computers in health care is limited primarily to the hospital setting or used for business procedures in the individual practitioner's office. Within the next few years we shall witness a much wider use in the practitioner's office. Such utilization is becoming apparent in many group practice settings where paper files and medical records are being converted to machine-readable formats. In the future, computerization of medical records will provide easily accessible patient information without having to read through a thick file in search of a single fact or being unable to find a record because it is sitting on an associate's desk.

Within the next five years we should also be working towards linking networks of hospital records with the records in the physician's office and the consolidation of records of patients referred from their primary physician to a specialist. A national health care records system, with every item of a citizen's health history available at any physician's office or hospital upon demand, is easily possible if the obvious invasion of privacy problems can be handled.

At the same time we shall increasingly utilize computerized diagnostic programs, which are already in practical use in some clinical areas. The development of clinical databases will permit physicians to call up information about specific drugs or to enter symptoms and indications and be given a list of drugs which might be prescribed. In western Pennsylvania, as an example, office practitioners will soon have practical computer assistance in making diagnoses from a University of Pittsburgh School of Medicine program called Caduceus. Physicians with computers will put Caduceus to work sorting out multiple disease hypotheses. Caduceus already covers 3,700 individually defined manifestations of some 550 of the 750 disease entities in internal medicine. A physician working with Caduceus would put uninterpreted observations of the patient into the computer—symptoms, physical signs, laboratory data, etc. The computer would then develop the appropriate disease hypothesis. Within the next ten years, similar systems which use artificial intelligence will be developed, tested and widely consulted for a large number of diseases and medical specialties. Also plausible is a national drug registry for controlled substances. A physician or pharmacist could check the computer to quickly determine if a patient has multiple prescription sources.

In the dental health sector, the use of computers in the office setting will be commonplace in the next five years. The American Dental Association has already begun a joint venture with a firm to create standard office management software for use in most dental offices in the country. The potential exists for a number of clinical and administrative applications. As the nature of dental disease changes from a restorative to a preventive orientation, the need to monitor patient progress is increasing. The use of computers connected directly to instruments used to detect periodontal disease is entirely possible. Detailed patient profiles can be created and maintained and then used for diagnostic, therapeutic and research purposes with no further effort than the dentist currently expends in a routine periodontal examination. Computer simulation of the dental arches and surrounding tissue will enable dentists to evaluate various options and alternatives in surgical and orthodontic treatment plans without the need for invasive procedures.

The widespread development and utilization of such systems will be dependent upon their integration into the education and continuing education programs of academic health care centers.

Education

PROFESSIONAL:
MEDICINE
DENTISTRY
NURSING
GRADUATE:
MASTER'S
DOCTORAL
RESIDENCY/FELLOWSHIP
CONTINUING EDUCATION

The educational programs at the Georgetown University Medical Center can be divided into four groups: professional education in the fields of medicine, dentistry and nursing; graduate education at the Master's and doctoral levels; residency and fellowship training programs; and continuing education programs.

In terms of student numbers in the Schools of Medicine, Dentistry and Nursing, Georgetown does not anticipate any increase over the next 10 years, but expects that there may be a slight decline. Recent studies in both medicine (1) and dentistry (2) have indicated sufficient numbers of practitioners over the next ten years and beyond and even indicated that a decline in enrollment levels for some schools would be desirable. National applications have declined approximately 16.3% in medicine and 51.0% in dentistry over the past eight years. In the case of nursing, recent studies of national needs for baccalaureate programs are not available. Despite some decline in national applications, it is currently felt that the Georgetown program has certain unique features which make it imperative to maintain enrollment at current levels.

Post-graduate education programs which presently exist at the Master's and Doctoral degree level in a variety of basic science, dental and nursing specialties will continue at approximately the same level with the possibility of some increases in nursing programs and in dental residencies of general practice and periodontics. As programs become less essential and are phased out, new ones in more relevant disciplines will be added. Medical residency programs will continue at approximately the same level. With national enrollment in schools of medicine either remaining the same or declining slightly, no major increases in overall numbers are anticipated; however, there may be changes in individual program numbers.

Continuing education programs will become even more important as the concept of life-long learning and self-education are more strongly stressed. In each health profession the emphasis will change over the next 10 years from education as we have thought of it in recent years, to continual re-education and the need to learn "how to learn." We anticipate that the content and method of health professional education at all levels will replace fact acquisition and memorization with a broad study of decision processes and strategies underlying patient care. The power brought to bear by the computer will alter the form of continuing education. Specifically, it will reduce the requirements for formal didactic teaching by providing learning opportunities within the context of patient care. What was subject-oriented will become patient-oriented and what was teacher-directed will become student-directed.

A recent study at Stanford University (3) projected that within the next five years:

- 80% of the Stanford faculty will have microcomputer based professional workstations in their offices and/or homes.
- All or almost all Stanford students will have a microcomputer or will have easy access to one.
- All support staff will use, as needed, computer-based technologies in their work.
- More than 50% of the University's scholarly output will be in machine-readable formats.
- The catalogs of the Stanford libraries and of the Library of Congress will be on the institution's central computing node and accessible by individuals from their workstations and there will be effective access to the library catalogs of the country's major research universities by these same individuals.

It is anticipated that the Georgetown University Medical Center will have reached this same stage within the next five to seven years.

Other recent reports have arrived at similar conclusions to the Stanford study. A recent report from the Association of Academic Health Centers (4) warns that as students enter medical school from colleges which are already using computers extensively, ". . . the mismatch of students to the academic medical environment will not be trivial." Changes in approaches to medical education are already projected. "Emerging Perspectives on the General Professional Education of the Physician" summarizes aspects of the AAMC project on "General Professional Education of the Physician" (GPEP) by highlighting the use of computers for development of clinical problem solving skills (1). The National Board of Medical Examiners recently announced its intent to change to a computer based testing system by 1988. Derek Bok, President of Harvard University, announced in the Harvard Magazine a new medical educational curriculum for approximately 25 students that incorporates use of computers as vital tools in the learning process (5).

In the Spring of 1985, the AAMC sponsored a major conference on Medical Informatics to apprise medical school deans and senior faculty of the impact of medical informatics and expert systems on biomedical information access. A number of key issues were addressed. Participants discussed the role of academic medical computer departments and stressed that each institution should proceed on its own, either to create a separate entity or to integrate courses into the existing curriculum. The role of the library in biomedical information transfer and management was discussed in relation to teaching students the skills needed to access a wide range of information resources for problem solving and clinical decision making. The establishment of a clearinghouse for software design and development was emphasized, and it was felt that the AAMC might be the logical choice to assume that responsibility. As the proliferation of expert systems and computer databases increases, the need for a more uniform medical language was stressed which would incorporate the NLM's Medical Subject Headings (MeSH), the International Classification of Diseases (ICD) and other recognized thesauri.

The educational forecast at Georgetown for automated information systems in undergraduate education includes the development and expansion of:

- Personal information systems that are primarily organizational and directive for each student, as a tool to manage the data available in lecture notes, textbooks, journals, etc;
- Interactive problem sets used to extend reduced classroom teaching and for remedial learning;
- Interactive survey programs in basic disciplines with visual capability, such as the NLM videodisk program in Basic Medical Pathology, which are conducive to individual and small group learning;
- Courses in computer competency, on a short term basis. (In about 4 years, entering students should have at least minimal computer competency.)

Faculty and staff will expect certain minimum computerized information resources and technological capabilities to be present if they are to consider Georgetown as an employer. Potential students in all fields will be applying the same criteria when evaluating Georgetown as their choice for a health care training institution.

Research

FUNDING PATTERNS
CORPORATE ENTITIES
PRODUCT-ORIENTED RESEARCH
TECHNOLOGICAL ADVANCES

The research environment throughout academic health science centers will experience changes in funding patterns, corporate arrangements between faculty and industry, more product-oriented research, and increased benefits from technological advances.

Since World War II, over $100 billion has been spent on biomedical research. Of this amount, federal agencies have provided $60 billion and the industrial sector $30 billion. Until 1983, the National Institutes of Health had been the largest single source of funds for biomedical research. In that year, the $4 billion expended by industry exceeded the $3.8 billion NIH research budget. It is anticipated that changes in funding patterns may cause increased instability of financial support for academic health sciences faculty engaged in research. This, in turn, may result in the more frequent occurrence of formal arrangements between faculty members and industry and may lead to the creation of faculty oriented corporate entities. These developments could bring about a shift from basic research to more applied, product-oriented investigation.

Over the next ten years, the researcher in all fields will enjoy the benefits of the new technologies which will result in a far more rapid flow of information from both the library and clinical research sites. State-of-the-art research techniques will demand knowledge and utilization of advanced technological equipment and procedures as well as a very broad knowledge of the disciplines of information gathering, analysis and interpretation. Funding for research will depend heavily on an institution's record of achievement and commitment to state-of-the-art technology.

In the past, the major research efforts at the Georgetown University Medical Center have been concentrated in the School of Medicine and in the Basic Science Departments. In recent years, the School of Nursing has increased its research activity and this trend is expected to continue. Computer hardware and software were purchased with grant monies for current nursing research projects; additional projects will necessitate the purchase of more systems, especially as faculty and students become increasingly computer literate. The School of Dentistry is also planning to increase its emphasis on research and to aggressively seek extramural funding for such endeavors.

As research endeavors increase in the Medical Center, information management will become more sophisticated to handle the increased volume and increasingly stringent external requirements for grant administration. In the future, material will be readily available from the computer in terms of biographical sketches, research interests, funding, status of faculty members, patents, publications, etc. Other information available on the computer can also be used to evaluate faculty research productivity and departmental resource use.

Management

PROSPECTIVE PAYMENT
DRG
COMPETITION
HEALTH CARE DELIVERY
INFORMATION DEMANDS

Management issues facing academic health science centers relate to shifts of inpatient reimbursement from retrospective to prospective payment, establishment of DRGs, competition and changes in health care delivery, and an increased demand for information to ensure cost effective management of scarce resources.

The most compelling management issue facing the Medical Center for the present and future is the radically changing methodology for reimbursing hospitals for inpatient care. The introduction of a prospective payment system for the Medicare program is the first step in what many observers believe to be a complete overhaul of the financial systems for hospital care in this country. Historically, hospitals have been reimbursed for essentially their costs on a retrospective basis. Starting with the present Fiscal Year the Medicare Program will reimburse hospitals for inpatient care on a prospective rate based upon a fixed price for a diagnostic related group (DRG) regardless of the length of stay or the intensity of resources consumption.

While this prospective payment system will currently affect only reimbursement for Medicare patients, it is most likely that the system, or variations on that theme, will be implemented for all other payors within the next few years. These changes have enormous implications on the operating and capital budgets of hospitals and will dramatically affect how medical care is delivered to the population. The need to improve productivity will become a driving force for all hospitals. It is likely that marginal activities, that is services that have questionable value given the relative cost of those services, will no longer be provided. It is further expected that competition for patients will become intense and therefore the competition between hospitals will become increasingly more bitter.

It is quite likely that the number of hospitals in this country will diminish in the near future and that only those hospitals that are well managed, with particular attention being paid to the mix of patients and the level of productivity in delivering services to those patients, will survive. It is further predicted that in the intermediate and long run, medical education and the values associated with the practice of medicine will change. No longer will it be permissible for medical students and junior house staff to order diagnostic and therapeutic tests without regard to the economic implications of those procedures. It is likely that clinical protocols will be developed which will direct the clinician towards a standard of care while diminishing the degree of freedom which the clinician historically had in determining the margin of utility of those services.

The use of computer databases and information management techniques, in general, will become increasingly more important to the extent that these systems contribute to a more intelligent use of an institution's resources. The whole issue of assessing the clinical outcome of care, given different changes in input resources, will become important from an institutional perspective as well as a public policy perspective.

The anticipated economic and social changes which will effect the administration of academic health centers dictate the need to acquire and interpret more information from more sources than ever before. Only through an integrated network of information processors can the management of these institutions obtain the information necessary for informed decisions. Administration's adjustment to increased information management demands will be encouraged and rewarded by the cost effectiveness of the new technological alternatives to current practices.

Information Access

ONLINE SYSTEMS
TRAINING
DATABASE DEVELOPMENT
COMPUTER LABORATORY
CONSULTING SERVICES

Libraries will continue to play a major role in information access by providing online systems, training users to access electronic information resources, developing databases, establishing computer labs for experimentation, and offering consulting services.

In the future, libraries will become a central clearing house for use of state-of-the-art technology for academic information services. The commercial world has recently recognized that libraries play a vital role in the Information Age, and they have stepped up development of systems and software programs suitable for libraries, especially academic libraries dedicated to education and research.

In the Medical Center we anticipate that the library will be tied more closely to the educational programs of the schools and the hospital. It will emerge as an active educational and training center with a stronger responsibility for supporting lifelong learning programs and information seeking skills. At first the instructional programs will include basic and some advanced computer courses for gathering and developing information systems. A laboratory setting with a variety of training and self-teaching programs will be provided. Assistance in database development and personal information systems for faculty and students by expertly trained staff will be an extended library service. Later on, computer assisted instructional packages developed by faculty, as well as by educational experts working for the library, will be made available for students, and continuing education materials will also be provided. A number of research support services previously unavailable will be provided by the library. Consultant services available through the library will provide Medical Center users with assistance in using new computer technologies to improve their research projects.

In addition to these changes in education and research, the library's services will become a more integral part of the patient care mainstream because significant changes will occur in the use of library information for health care delivery. Scenarios may include use of newly developed library databases to store and retieve information on drug interaction for treatment protocols. Databases in special disciplines, diagnostic systems and artificial intelligence systems available through clearinghouse mechanisms established by the library will be used by physicians and medical students for information to verify their approach to patient care. Electronically transmitted full-text articles will enable physicians to read or scan directly from the hospital or their offices critical pieces of literature pertinent to patient diagnoses and treatment modalities.

Technology

COMMUNICATIONS
HARDWARE
SOFTWARE

The wide range of technological options available today and newer advances currently under development will have a significant impact on traditional ways of handling information. User requirements will adapt and evolve as new system capabilities and improved products and services emerge.

The institutional focus on technology must recognize its ever-changing nature and that the infatuation which exists (implying that all problems can be solved with it) may not continue. Planners must look beyond the current excitement of those who extol the virtues of "high-tech" and beyond the scrambling among countless vendors who purport to be able to provide and support "the system" better than competition.

The one technology now available to large organizations that will have the greatest impact over the next decade is communications. From the use of personal computers, which can now be used to improve intra-personal communications, to the future use of digital networks to connect an array of different devices and transmit information among them, the common denominator is the conveyance of information, that is, communications. Caution must be exercised, however, in the implementation of any concept that has not yet matured.

Many questions remain unanswered, and the potential for disaster is too great to permit hasty decisions on matters that could seriously effect the integrity of an institutional communications system capable of servicing the Medical Center and flexible enough to address the changing nature of the environment. For example, which of the media available for transmission of information will emerge as the dominant one? There are several possibilities: copper wire/twisted pair (e.g. telephone lines already in place) is low speed and inexpensive; coaxial cable allows data, voice and video transmission, but is more expensive than twisted pair; optical fiber is potentailly better than coaxial cable, but is not currently in common use; microwave is a good alternative because it requires no medium—transmission is through free space—but physical obstacles can be a problem and a signal can fade over long distances. Another consideration is whether voice, data and video should be combined or kept separate. There are predictions that cellular radio technology could put a portable telephone on everyone's person in 5 years, and this is good for voice and data transmission. Also important to ask is: should all communications be on a single system? Possible security problems or system failures if the entire system goes down must be taken into account.

There are a number of other trends which will effect the use of computer technology in the future, making it more cost effective as well as more practical to implement. Computer hardware will continue to make improvements in performance as internal memory capacities increase dramatically to the point that minimum system configurations will be measured in megabytes. Hardware considerations of the future will also include:

- the significant increase of external (disk) storage;
- the improved central processor speed of execution and range of capability;
- the impending compatibility among major vendors;
- more intelligent peripheral devices that will depend less on the host computer;
- more rapid and comfortable user interaction due to voice synthesis and recognition.

Software considerations will include:

- the common presence of database utilities, and easy and inexpensive access to large databases for commercial, educational and personal applications;
- the integration of many currently separate functions, such as database management and word processing; a user will download data from large databases into a personal computer, store it, move it into word processor programs, create reports or graphs, then transmit it to another file or computer for later use;
- software that is written to take advantage of improved hardware performance, e.g. increased memory will allow for more integration of software;
- the emergence of artificial intelligence techniques that will make computing a more cognitive process and less transaction oriented;

the existence of new software tools that will allow users to individualize "canned" software to meet their needs.

The dynamic nature of the environment dictates a course of action which encourages participation and involvement with technology on an institution-wide basis, without irreversible commitment to a specific form of the technology. An organization must exist within the institution to chart the course, and it should look no more than 5 years to the future, as it is impossible to predict accurately beyond that time period. The primary objectives should be the:

identification of appropriate technologies and evaluation of their impact on those concerned, e.g. the effect of computer assisted instruction on students and faculty;

provision of resources to students, faculty and staff on an individual basis;

avoidance of commitment to elaborate plans that depend on a single solution, i.e. no alternatives;

flexibility of the system so that it allows for change or is at least inexpensive enough to allow for replacement within 5 years;

emphasis on individual use of technology to create a literate and intelligent user population;

provision of access to data and information, not only physical access via hardware and communications, but also assistance via an educated service and support group of librarians and consultants;

education of students, faculty and staff not only in the mechanics of using technology, but also in the benefits it can provide.

Conclusion

These are some important trends from which the Medical Center can begin to build its concept for an IAIMS at Georgetown University. Already a reality is the growing use of computers and communications technology to improve the transmission of biomedical information to health practitioners for the delivery of patient care. These trends have obvious implications on the education of health professionals at the undergraduate, graduate and continuing education levels. Georgetown University will address approaches of merging familiar programs with current technologies in the educational area. The promise of providing information more efficiently to researchers and to disseminate research discoveries more effectively to health providers through these new technologies introduces exciting possibilites to the Medical Center's basic sciences research programs. How information seeking skills are changing and the need to prepare health professionals more adequately to feel comfortable using the new technologies extends and presents many challenges.

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Patient Care
Education
Academic
Health
Science
Center
Management
Research

Volume 4: INSTITUTIONAL SELF STUDY

Helen E. Bagdoyan

.... 157
Introduction 158
Institutional Policy and Mission 165
Assessment of Technological Capabilities 174
Functional Goals 182
Short and Long Range System Requirements 185
Conclusion 186
Appendices ....

Table of Contents

INTRODUCTION 157

INSTITUTIONAL POLICY AND MISSION STATEMENT

Mission 158

Information Policy 158

Background 159

Steps and Procedures:

- Georgetown Approach 160
- Selection of Issues 160
- Information Team Responsibility 162
- Faculty Involvement 162

Bibliography 162

ASSESSMENT OF TECHNOLOGICAL CAPABILITIES FOR IAIMS SUPPORT

Introduction 165

Self Study Inventory and Analysis 165

- Inventory 165
- Analysis 166

Methodology 170

Inventory Process 170

Development of Self Study Inventory Database 171

FUNCTIONAL ACADEMIC INFORMATION MANAGEMENT GOALS

Introduction 174

Needs Assessment 174

- Information Use Scenarios 174
- System Functional Requirements 174

Identification of Technologies 180

Impact of Potential Applications of Information Technologies 180

SHORT AND LONG RANGE INFORMATION MANAGEMENT SYSTEM REQUIREMENTS

Introduction 182

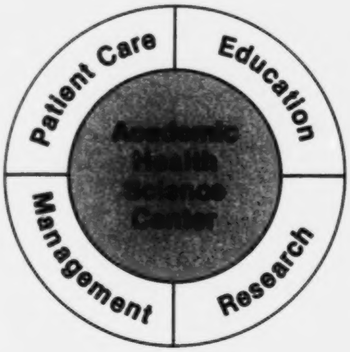
Approach 182

Potential Impact on Georgetown Mission 183

CONCLUSION 185

APPENDICES 186

Introduction



During the past year and a half the Georgetown University Medical Center has been engaged in Phase I of Strategic Planning for an Integrated Academic Information Management System (IAIMS) under a contract funded by the National Library of Medicine (NLM) to develop an Implementation Plan. The first item associated with the contract requirements was preparation of Self Study Planning Documents that set the stage for the Medical Center's Implementation Plan.

To build a system as complex as IAIMS, Georgetown needed to address a number of penetrating issues. It was vital to develop an environmental forecast that highlighted not only the trends in health education, research and patient care but also the impact of advancing technologies in the Information Age. Although the University's mission statement, and more specifically, the Medical Center's long range plan already addressed the institution's information policy from a strategic viewpoint, there were numerous functional information policy issues that required a more definitive position statement. The most logical approach to establishing an IAIMS at Georgetown further required a review of existing technological capabilities and consideration of functional information management goals. These were conducted through a self study inventory and a review of information flow patterns. Once the technological aspects were identified, short and long range information management system requirements were more clearly delineated for future planning.

This Institutional Self Study highlights the findings of Georgetown's existing capabilities. It is from this basic foundation that future plans and strategies have emerged to develop the IAIMS Implementation Plan.

Institutional Policy and Mission Statement

Introduction—Mission

PROGRESSIVE EDUCATION
QUALITY PATIENT CARE
INTERDISCIPLINARY RESEARCH
COMMUNITY RESPONSIBILITY

The mission of Georgetown University is to provide quality education and to encourage the pursuit of knowledge. Consistent with this mission, the Medical Center's long range plan includes a number of goals and objectives to strive for excellence and improve the quality of education, research and patient care.

To accomplish this basic mission, the Medical Center has four major goals:

- To provide a progressive education which prepares health professions students to comprehend and practice an interdisciplinary approach to health care;
- To meet the health care needs of society by providing quality services to patients of all races, religions, and socioeconomic backgrounds and utilizing the most up-to-date treatment modalities available;
- To extend the limits of knowledge through research programs that are interdisciplinary in scope and which create an environment that instills in students a spirit of investigation, leading to penetrating observations and the continued pursuit of knowledge; and
- To build a sense of community responsibility through education, patient care, and research programs which extend beyond the Medical Center campus to the Washington, DC metropolitan area, the nation and the world.

The long range plan lays the basic foundation for an institutional information policy in the generic educational goal under the objective to promote and enrich the environment for the academic, scholarly and service activities of the Medical Center. This objective includes maintaining information resources for expanding research, developing conditions for scholarly pursuits for both faculty and students, providing facilities and a milieu for the conduct of academic affairs, supplying the resources to acquire, support and disseminate knowledge and to review, evaluate and relate ethical and social considerations to health professionals. In this section, the stated aim is to develop an integrated approach to information transfer.

Improved utilization of knowledge and management of information will provide the foundation for future progress in the many complex activities of education, patient care and research and for the ongoing fulfillment of the Medical Center's mission. Georgetown, like many other health care centers, is moving towards an environment of end-user access to institutional data through an Integrated Academic Information Management System, IAIMS. The backbone of IAIMS is an electronic telecommunications network, capable of linking Medical Center users. The complexities of operating and maintaining this communications network necessitates development of an institutional policy that establishes basic principles and operational guidelines for efficient transfer of information throughout the Medical Center.

Information Policy

The Information Policy for the Medical Center, described below, is designed to meet the general operational needs of the IAIMS network at Georgetown. It should be viewed from the perspective that it is based on the current state-of-the-art technologies and disciplines involved, and how they will be applied to and utilized by the Georgetown IAIMS. It is recognized that the nature of the environment is extremely dynamic and that its evolutionary character will require that the policy undergo continual assessment and modification to keep pace with the technological, behavioral, organizational and institutional changes that will occur in the future. Seven statements cover a common policy for the Medical Center and include: Access, Confidentiality, Fees, Ownership, Quality Control, Security and Standardization. Specific departments and divisions within the five major operating units of the Medical Center (Schools of Dentistry, Medicine and Nursing; the Hospital; and the Library) may have internal policies and protocols that must be recognized by users of the IAIMS network. An attempt has been made to follow the University's policies as established in the Faculty Handbook.

The seven key Information Policy positions appropriate to the IAIMS, are as follows:

1. **Access**

   A directory of Medical Center databases will be provided through IAIMS. Databases will be identified and procedures for access will be outlined. Determining the scope of accessibility is the responsibility of the individual units operating and maintaining a database.

2. **Confidentiality**

   It is presumed that most data generated at the Medical Center is privileged and protected by law or policy. Individual units which generate and maintain online systems shall establish and enforce criteria and procedures consistent with applicable laws, regulations and University policy, defining confidential data and determining who is entitled access to confidential information.

3. **Fees**

   Generally, the policy of the Medical Center is to provide look-up access free of charge within the University community to computer databases maintained internally. There may be charges to users for materials and equipment needed for special services such as reassembling routine data into unique formats. Costs incurred through access to external computer databases will be passed on to users.

4. **Ownership**

   Faculty research, publications, software and inventions are governed by policies stated in the Faculty Handbook. Data and software used for Medical Center administration and operations will be controlled by the department or unit responsible for their development and maintenance.

5. **Quality Control**

   Units providing data in the IAIMS network will establish procedures to ensure accuracy and currency of records. National standards for quality control will be followed wherever possible.

6. **Security**

   Units participating in the IAIMS network are responsible for establishing procedures to:

   - Prevent inaccurate data entry, unwarranted deletions and unauthorized use or theft;
   - Protect software and hardware from physical damage and theft;
   - Provide adequate backup systems for automated operations wherever possible.

   Common elements of the IAIMS network will be protected by the IAIMS Program Manager who will be responsible for operating the system. Sanctions for violations at the intra-institutional level are to be developed by individual units.

7. **Standardization**

   To facilitate electronic communication among participants in the IAIMS network, the IAIMS Program Manager, in conjunction with representatives of the Medical Center units, may define a variety of standards for hardware interface and future software development.

Background

The first major activity of the IAIMS contract involved the Implementation of a Strategic Planning Process for an IAIMS. The development of an Information Policy was one of seven objectives outlined in the Planning Process.Georgetown was charged with the task of developing an Information Policy that relates to a mission statement for the institution and specific goals for its multiple functions.

In its Technical Proposal, Georgetown detailed the approach to be taken to develop an Information Policy and specified five related tasks to accomplish this objective: "(1) to encourage a free flow of information (storage and retrieval) for education, patient care and research purposes; (2) to establish a code of ethics that acknowledges and protects vital clinical and research records; (3) to establish policy to determine who uses IAIMS; (4) to make maximum use of new technology and look towards standardizing databases, language and equipment; and (5) to determine who owns data—the University?"

A more detailed description, contained in the Georgetown Proposal states that: "The development of an Information Policy for the Georgetown University Medical Center will be consistent with the mission of the University to provide quality education and to encourage the pursuit of knowledge. A generic goal, related to information, is to promote and enrich the environment for the academic, scholarly and service activities of the Medical Center. This goal includes maintaining information resources for expanding research, developing conditions for scholarly pursuits for both faculty and students, providing facilities and a milieu for the conduct of academic affairs, supplying the resources to acquire, support and disseminate knowledge and to review, evaluate and relate ethical and social considerations to health professionals.

"Specifically, the educational mission and goals, to maintain and improve excellence in academic instruction and learning, relate not only to selecting and developing competent faculty, but to refining the environment to use new technology in teaching and encouraging a free flow of information for research investigations that improve skills. Information data flow will provide a support arm to the research mission of the Medical Center. To broaden the scope of research at each of the units, appropriate tools for storing and transferring information will be incorporated in the plan.

"Recognizing that patient care is a major mission of the Medical Center, it is vitally important that the Information Policy establishes a code of ethics that protects vital clinical and research records and observes physician/patient confidentiality. Guidelines and goals to be established will also enhance clinical and community services.

"Policy issues to determine who uses the IAIMS network will include consideration of all appropriate users. The rapid transfer of information to nurses, physicians, dentists, technicians and all individuals involved with patients, at whatever site or workstation they may be located, can save man-hours and energy while enabling these health professionals to provide better-informed patient care. The intent of IAIMS is to meet the needs of many users rather than being exclusive. For obvious reasons, the Information Policy goal will require the establishment of standards for databases, languages and hardware to build an effective, usable network. Another policy issue is to link existing systems in a decentralized, rather than centralized system. In addition, maximum use of new technology is a desirable planning goal for the IAIMS. Ownership of data will be another vital policy issue. Presumably the University owns the data.

"Ownership of data, the type of users and their purpose for accessing the system will require policy decisions that are both fiscal and managerial. Fiscal concerns are directly related to the Information Policy. While national megatrends lean toward dispersed information sources, a vital goal at Georgetown is to develop a well-coordinated, integrated system with economy of purpose. The strategic planning process will emphasize the development of an Information Policy which responds to the overall needs of the Medical Center and considerable effort will be placed on refining these goals and issues."

Steps and Procedures

Georgetown Approach: Several major factors were considered throughout the planning process in developing Georgetown's institutional Information Policy. They included:

- Autonomy of the five operating units within the Medical Center organization structure;
- Decentralized approach for the IAIMS concept which stresses functional, rather than physical, integration;
- Diversity of information resources generated at Georgetown;
- Varying levels of confidentiality requirements within each operating unit; and
- Need for flexibility in policy to accommodate inevitable changes which will occur with new technologies, new information resources, and new user needs.

Once the seven key issues were identified and detailed analyses made, the Information Policy drafts began to evolve. The initial drafts contained specific position statements suitable to each operating unit for issues of access and confidentiality and had common policy statements for the remaining five issues. Later drafts and the final version of the Information Policy incorporated a common policy for all seven issues. Wherever possible, internal policy already established at Georgetown was utilized. The issue of ownership of software reflects policies contained in the Faculty Handbook for publication, copyright, inventions and patents. (See Appendix 1.) A dominant theme carried throughout all the policy drafts into the final version stated that users of the IAIMS network would have to recognize that each operating unit may have internal policies and protocols for accessing and using their information resources. An example is contained in the draft policy statement for the Dahlgren Memorial Library. (See Appendix 2.)

Selection of Policy Issues: Issues that Georgetown considered essential for their IAIMS Information Policy included Access, Confidentiality, Fees, Ownership, Quality Control, Security, and Standardization. Each issue was studied by consulting the published literature, examining current practices and experience at Georgetown and elsewhere, and in discussions with IAIMS team members at regularly scheduled meetings. For each of the seven policy issues, a detailed analysis was undertaken to examine aspects which should be considered. Georgetown's approach placed heavy emphasis on promoting availability and sharing of information resources throughout the Medical Center, recognizing the need to have some limit of access, removing barriers to access by ensuring communication and network compatibility, protecting the confidentiality of some data, and defining legal rights of ownership for information and systems. (See Appendix 3.) The following outline summarizes the points which were studied:

1. **Access**

   Data sources and access points

   - Directory of databases and information sources
   - Location of files
   - Mechanism for updating directory

   Priority levels

   - Access to specific files, to specific records within files, to specific fields within records
   - Read data
   - Read, write, change data
   - Read, write, change, delete data

   System priorities

   - First come, first served?
   - Or, patient care first?

   Hardware and software choices

   - Packages which control access
   - Local area networks
   - Compatible operating systems with networking capabilities

2. **Confidentiality**

   Key point: becomes an essential issue in relation to medical and patient records, student records, and budget, management and personnel data; sharing however, should be encouraged

   Authorized access

   - Establish classification of confidential data
   - Make provision for private files
   - Develop authorization tables for access

   Right to privacy

   Medical and patient records, etc.

   - Safeguards for electronic formats as applied to hard copy
   - Guidelines for release and use of patient information

   Database integration: some files should remain separate and not be consolidated

3. **Fees**

   Databases maintained internally—free of charge to Georgetown users.

   External databases—prorated.

   Charges for special services.

4. **Ownership**

   Data owned by the University and not by individuals or departments

   Use of copyrights, trade- or service-marks for content of databases, software packages, and hardware modifications developed at Georgetown

5. **Quality Control**

   Data collection

   Data storage and dissemination

6. **Security**

   Areas to be secured

   - Data
     a. Protection from unintended deletions or alterations by unauthorized persons
     b. Electronic eavesdroppers
     c. Unauthorized use and theft of data output
   - Memory
   - Terminals
   - Hardware
     a. Protection from fire, theft, flood, sabotage, electrical problems, air conditioning failures
     b. Vendor support
     c. Back-up systems
   - Software
     a. Georgetown developed
     b. Use of transparent operating systems

   Security precautions

   - Access priorities
   - Disaster plans
   - System priorities

7. **Standardization**

   Advantages

   - Eliminates barriers to use
   - Provides ease of access to multiple, heterogenous databases
   - Increases flexibility for system enhancements and modifications

Internal and external operations

- Programming languages
- Coding, labelling, file structure
- Languages for processing text
- Computer and communications hardware
- Input/output interfaces
- Documentation

Information Team Responsibility: The Principal Investigator charged the IAIMS Information Team with the responsibility of developing an Information Policy for the Georgetown University Medical Center IAIMS network. The Team's initial tasks involved reviewing the issues outlined in the Technical Proposal, targeting additional issues which might be needed, establishing a reading file of pertinent articles, and contacting other institutions and organizations with known information policies.

A discussion guide for the first Information Team meeting touched on several topics. The Team was asked to project what the information environment might be in the United States over the next five to ten years in terms of information flow, types of information networks, database development, and ethical and policy issues. It was also suggested that the Team consider aspects such as the state-of-the-art in database development with online systems and electronic publishing, the extent of automated information resources in the health care field, and where Georgetown might be in the next five to ten years based on optimistic, pessimistic, and moderate forecasts. Seven policy and ethical issues were listed and assignments made to prepare written statements on issues of confidentiality, security, access, ownership, standardization, quality control, and fees and charges. (See Appendix 4.)

An extensive reading file, already being developed by the Information Team for the entire IAIMS project, was further augmented with articles pertaining to the seven key policy issues being considered.

Faculty Involvement: Faculty involvement, in identifying issues and developing an institutional Information Policy for Georgetown, was continuous throughout the planning year. Discussions of issues took place at most of the monthly Development Team meetings in which faculty representatives from all units are participants. Four faculty members are on the IAIMS Information Team and have been instrumental in identifying issues and developing policy drafts. Additional faculty were invited to the March 1, 1984 offsite retreat at which time the Information policy issues were discussed and comments solicited through a "straw-man" approach.

The Information Team had prepared 5 drafts of the Information Policy and these were circulated to all IAIMS project participants for review and comment. It had also been possible to widen the scope of faculty participation through several other mechanisms. Draft copies of the Policy issues were also circulated to three standing committees: the Medical Center Computer Committee, the Educational Technology Committee of the School of Medicine, and the Curriculum Committee for the School of Nursing.

Once the Development Team and its representatives from each of the operating units reached consensus on the IAIMS Information Policy, a final review process was initiated. The Policy was presented to the Executive Faculties of the three schools for review, comments, revisions, and approval. The IAIMS Executive Advisory Board was also asked to make a final review of the Georgetown Information Policy and provided guidance to the Development Team. The ultimate authority for establishing policy at Georgetown rests with the Medical Center Council. The final version of the Georgetown Information Policy was submitted to this group and approval was obtained.

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Assessment of Technological Capabilities for IAIMS Support

Introduction

The second major activity of the IAIMS contract involved conducting a Series of Self Studies as an essential part of the Strategic Planning Process. The Self Studies undertook a realistic examination of the technological resources and the degree of automation presently in existence at Georgetown. The purpose of the Self Study Analysis was to identify current resources and match them to the ultimate academic information management goals of the Medical Center. To achieve this end, two key objectives with related tasks were undertaken: (1) to assess the technological capabilities of Georgetown and (2) to determine the functional academic information management goals.

Self Study Inventory and Analysis

The key objective of the Self Study activity was to assess the technological capabilities of the Medical Center through a comprehensive inventory of existing hardware, software, and personnel resources so that Georgetown could begin to identify demands for information and determine the technological implications of establishing an IAIMS. Foremost among the issues to be addressed was the question of networking or creating electronic links. Data for the Self Study process was collected through the use of a Brief Questionnaire followed by personal interviews of 49 departments/divisions and compiled into an online database with an established mechanism for quarterly updates.

Inventory

A general summary of the Medical Center's hardware inventory revealed the following characteristics. The Medical Center has over 1,400 various equipment items consisting of microcomputers, word processors, minicomputers, a mainframe and related peripherals. To-date, the cumulated hardware/software costs total approximately $6M to $7M. The minicomputers are largely DEC or Data General; the microcomputers are IBM or Apple and the modems operate primarily at 300 or 1200 baud. The Hospital and the Library operate the general use computers; the others are departmental machines for diagnosis or special research studies. Computer services are used to handle special work such as the Faculty Practice Plan, poison information and the dental clinical data. Information flow patterns indicate significant external information accessed by Georgetown from vendors and services, but only moderate flow from Georgetown to other institutions. For details, see table below:

Summary of Computer and Information Flow Inventory

1. EQUIPMENT SUMMARY

Respondent Departments/Divisions 49

Equipment	Quantity	# Departments
Word processors	51	19
Microcomputers	163	34
Minicomputers	35	14
Mainframes	1	1
Terminals	634	37
Printers	332	38
Modems	91	27
Video monitors	42	13
Barcode readers	29	3
Additional equipment	53	13
TOTAL	1,431	

2. COST SUMMARY

Hardware and Software Investment Range .... $6-$7 million

3. HARDWARE CHARACTERISTICS

Minicomputers:	
DEC	37%
Data General	26%
Others	37%
Microcomputers:	
IBM	61%
Apple	24%
Others	15%

Modems:

90% standalone modems operate at 300 and 1200 bps; approximately 8 of 91 modems operate at speeds greater than 1200.

4. MAJOR MINICOMPUTER CONCENTRATIONS

Hospital/HIS	7 (Data General)
Cardiology	4 (2 each PDP 11/34, 11/23)
Radiology	5 (PDP 11/34, 11/44; Philips; VAX 11/730; Data General)
Radiation Medicine	2 (PDP 11/44; EMI)
Dahlgren Library/LIS	2 (PDP 11/44, VAX 785)

9/84

5. USE OF REMOTE PROCESSING CENTERS/DIRECT LINES

Medical School—Controller/ Dean's Office	SDC (California)
Poison Control—Hospital	Micromedics (Colorado)
Dental School—Clinic	Data Day (Florida)

6. CURRENT INFORMATION FLOW CHARACTERISTICS

   35 departments access mainframes (CCF, SDC, etc)

   27 departments access minicomputers (LIS, HIS, etc)

   Significant external flow to sites outside Georgetown:

   (SDC, NLM, NIH, NBRF, etc)

   Moderate flow from institutions to Medical Center:

   Poison Center

   20+ libraries access LIS

   External flow via public switched network at low speed (300 or 1200 bps): leased lines to SDC

As the above data indicates, there is heavy hospital use of the Hospital Information System (HIS) but few interconnections among Medical Center units. While several departments access the Library Information System (LIS), there is no interdepartmental access to any other Georgetown system. There is significant interest in and plans to extend interdepartmental access to the Library. The only on-campus mini- to minicomputer connection is through the Hospital Information System. Although there is much interest, there is no micro- to microcomputer network now operational. There are numerous current departmental/divisional databases and substantial growth is projected.

Analysis

The assessment of technological capabilities of Georgetown, derived from the self study inventory, yielded the follwing analysis:

1. **Technologies of the Medical Center Libraries.**

The Dahlgren Memorial Library is the primary Medical Center library; however, there are also 27 departments within the Medical Center which maintain libraries. The Dahlgren Memorial Library is the only library on the Georgetown campus which is fully automated. Approximately 17 departments access the Library Information System of the Dahlgren Memorial Library—generally through a dial-up mode. Three computer stations, located respectively in the Lombardi Cancer Center, the Department of Medicine's Jeghers Room, and the School of Nursing faculty laboratory, are directly connected through leased lines to the Library Information System (LIS).

The Dahlgren Library was inventoried during the self study activity. A complete list of computer equipment is included in the Library's "IAIMS Inventory Unit Record." (See Appendix 7.) The Library Information System (LIS) is an integrated online system written in ANSI MUMPS language and has been operational since 1981. The library has a PDP 11/44 minicomputer with 2 megabytes of memory and 3 hard disk drives with a maximum storage capacity of 1 gigabyte. Peripheral equipment consists of 2 magnetic tape drives; capacity for 48 ports/terminals/ 15 dial-up modems; 5 removable disk packs; 35 Lear Siegler terminals; 1 DEC VT 220, 1 DEC VT 101, and 1 DEC VT 102; 3 DECwriter printers; 16 Microline printers; 2 Axion microprinters; 2 letter-quality AlphaGraph printers; 6 Intermec 9300 and 1 Intermec 9400 Barcode readers; and 1 Symbol Technologies laser scanner. The Library Computer Information Services (LCIS) and other library support services houses an additional 5 IBM-PC microcomputers, 4 Apple II+ microcomputers, 3 Apple Macintosh microcomputers and 1 Apple IIe microcomputer.

Staff expertise in systems design, programming, and technical management of computers is sophisticated. The Library has 5 FTE programmers and 1 FTE electronic technician. All 13 librarians and 16 staff members as well as student assistants are competent in computer operations. The Pharmaceutical Information Exchange project and the Self Study Inventory Database have recently involved the staff in new database design and development. Staff have also become actively involved in computer literacy through such programs as MICRO DAY, held on May 9, 1984 and devoted to introducing Medical Center faculty and staff to user-friendly database systems. The LCIS is providing courses to faculty on microcomputers and database management. The LCIS has also undertaken to expand the Library's collection in computer-assisted instruction and computer-aided diagnosis programs.

2. **Uses and Networking of Computers in Research Laboratories and Offices.**

a. **Computer Uses in the Medical Center:** Computer use in research laboratories tends to fall into the following broad categories: inventories of equipment and materials; data storage, organization, and retrieval; budgeting; and tracking of experimental tasks. The Pharmacology Department has actually programmed several microcomputers to drive laboratory experiments without direct human intervention. The Lombardi Cancer Center and the Division of Cardiology each maintain clinical research databases for tracing patient data through protocols and clinical trials.

Computer use in offices falls into a slightly different set of categories with word processing, financial planning, and patient billing programs leading the list. On the departmental level, microcomputers predominate over minicomputers for routine research and office procedures. There are currently 163 microcomputers in 34 departments versus 35 minicomputers in 14 departments.

Types of applications software used with microcomputers verifies their heavy use for word processing, budgeting, and inventories. Applications software are outlined in Summary Report 5—Software Summary by Hardware Type. (See Appendix 8.)

Minicomputers are used to run the Library Information System, Hospital Information System, and patient care systems in departments such as Radiation Medicine and Cardiology. Two minicomputers currently serve as the front-end processors for the Faculty Practice Plan whose central mainframe is located in California. There is one mainframe computer, an IBM 4371, located in the Hospital. In addition, heavy use is made of the downcampus mainframe computer and of several external computers, such as the NIH Prophet System, for large-scale statistical analysis. A list of applications software for minicomputers is also included in Summary Report 5. The list is brief since most minicomputer programs are written in-house for very specific purposes. For instance, the office of Radiation Control has programmed its minicomputer to track the location of radioactive materials throughout the Medical Center campus.

b. **Networking:** Nearly every department included in the Self Study Inventory Database is familiar with the concept of electronic networking. Internally, a good foundation for a Medical Center-wide network has already been built. Over 264 terminals are linked to the Hospital Information System and 65 terminals access the Faculty Practice Plan. The Library has over 60 terminals with direct access to its computer and also provides remote access through 4 dial-up ports. Eighteen terminals, located throughout the Dental Clinic, are tied directly to a minicomputer in Florida through 2 multiplexors. Each of these four systems, however, has operated independently to date and there has been limited linkage across departments and schools.

With the growing interest in electronic mail, local area networks, and databases for administrative support, attitudes toward on-campus networking appear to be changing. There are currently 84 modems at GUMC held by 27 departments. (See the report entitled "Equipment Summary by Manufacturer/Model" under Appendix 8 for a complete listing of GUMC-owned modems.) These modems are used not only to communicate with external systems, such as MEDLARS and AMA-NET, but to access departmental computers. For instance, the Medical School Admissions Office has its files mounted on the Library's minicomputer, and the office of Continuing Medical Education has a dial-up link to Community and Family Medicine. The Pharmacology Department has already installed an intradepartmental local area network capable of tying into similar systems. The planned upgrade of computer equipment for participants in the Faculty Practice Plan should result in an additional on-campus local area network. Communications software which permits IBM personal computers to access otherwise incompatible computers has already made its appearance on the Medical Center campus. Computer networking is clearly here to stay.

c. **Internal Databases:** Many of the automated departmental databases identified through the Self Study Inventory will serve as a solid basis for future networking functions at Georgetown. The following table provides a brief description of 40 automated files:

Department	Database Name	Content
Anatomy	Prophet	Statistical and experimental data; grant supported through NIH.
Anesthesia	Anesthesia Knowledge Base	Formula for age, weight, etc. of patient; used to determine dosage range.

Department	Database Name	Content
Chancellor's Office	Personnel Database	Personnel data.
	Radiation Workers	Location of radioactive materials, exposures to radioactive materials.
Clinical Labs	Lab Results	Clinical lab results; mounted in HIS.
Dahlgren Library	Library Information System (LIS)	8 integrated modules for library functions.
	miniMEDLINE SYSTEM	User-friendly bibliographic file of citations from 163 journals, 1982 to present.
	DOC (Dahlgren Online Catalog)	Book, journal & AV holdings.
Dental School	Student Records	Student Records.
	University Financial Aid System	Student Financial Records.
	Dental Clinic	Patient records, billing.
Emergency Medicine	Patient Records	Patient data housed in HIS.
Hospital	Hospital Information System (HIS)	Records for patient care & hospital administration; currently, 42 components.
Immunology	Patient histories	Patient registration, test results, billing.
Lombardi Cancer Center	Experimental data	Multiple databases created with AIMS DBMS.
Medical School	Student Admissions	Applicant information.
	CME Course Database	Physician registration: SS#, specialty, credits taken, alma mater, etc.
	Payroll Simulator	Faculty & staff payroll.
	Budget Model	Budget history.
	Med A/R	Patient accounting.
	Faculty Practice Plan	Outpatient data & billing.
	University Financial Aid System	Student financial aid records.
	Debt Management	CAI program for students receiving financial aid.
	Personal Financial Planning	CAI program for students receiving financial aid.
	Sponsored Research Database	Protocols, proposals, awards, grant salaries.
	Faculty Contracts	Salary, rank, etc.
Medicine	Patient Accounts	Account number, name, billing, collection history.
	Cardiac Catheterization	Clinical cardiac catheterization data.
Neurology	CENOG	Computerized electro-neuro-ophthalmograph data.
	Cerebral Blood Flow Analysis	Patient care data.
Nursing School	Pregnancy Database	Support materials for Nurse-Midwifery Program.
	Gerontology Database	Support materials for Graduate Program.

Department	Database Name	Content
Pediatrics	Financial Data	Salaries, budget, etc.
	USDA Handbook #8	Nutritional data.
	Consumer Food Economic Institute Database	Nutritional data.
	Eatsmart Database	Nutritional data.
Pharmacology	Pharmacology Files	Departmental & personal files; local area network.
Radiation Medicine	Treatment Planning	Beam data, patient geometry.
Surgery	Cardiovascular Patient Data Files	Patient history data.

3. Uses and Networking of Computers for Manuscript Preparation: According to data gathered during the Self Study, there are currently 51 word processors in 19 departments on the Medical Center campus. Each of these machines is dedicated to such tasks as text editing, bibliography compilation, and manuscript preparation. In addition to these dedicated machines, there are 163 microcomputers housed in 34 departments with variable uses including word processing. Four GUMC minicomputer systems have word processing capabilities adapted specifically to individual departments, and a word processing option is available for participants in the Hospital Information System.

The following applications software programs for microcomputers are used for word processing on the Medical Center campus:

Apple Graphics
Apple Writer
Chartmaster
MacWrite
Magicwand
Mailmerge
PFS:Proof
PFS:Write
Scriptsit
Superscriptsit
ThinkTank
Typing Tutor
Volkswriter
Volkswriter Deluxe
Wordhandler
Wordstar

The use of microcomputers for text editing and manuscript preparation will increase on the Medical Center campus as the Library continues to provide intermediary and advanced courses for faculty and staff in database applications and management systems.

4. Use of Computers for Inter- and Intra-Institutional Information Exchange: Generally, most networking for information exchange is internal. The majority is conducted within the Medical Center. However, some information exchange between Main Campus, the Medical Center and off campus computers exists. Plans are to give Medical Center users access to the main campus accounting system in December 1985. This access will be solely for look-up purposes at first. Seven on-campus computer systems are utilized currently by Medical Center departments/divisions and include the following:

Admissions and Development Information System
Central Computer Facility
Downcampus IBM 370 used by Dept. Immunology
Hospital Information System
Library Information System
Patient Appointment and Scheduling System.

There are 21 additional external computer systems accessed by the Medical Center departments/divisions included in the Self Study Inventory Database. They include the following:

AMA/GTE
BRS
Dental Minicomputer
DIALOG
Donor Organ Database
Drugdex
Emergindex
Clinical Laboratory Results
Nat. Ctr. Maternal Child Health Educ.
National Poison Exposure Database
NBRF
NIH
NLM
OCLC
OSI
PHILSOM
Poisindex
SDC—bibliographic files
SDC—FACULTY PRACTICE PLAN
The Source
University Financial Aid System.

Several computer systems which are essential to the smooth operation of the Medical Center are actually situated off-campus. The Dental Clinic minicomputer is located in Florida and the mainframe of the Faculty Practice Plan in California. The University Financial Aid System was developed to University specifications by an outside contractor and operates on a mainframe located in downtown Washington. It is a cooperative venture of all four University Financial Aid Offices.

In addition to the systems outlined above, there are several unique interinstitutional arrangements on the Medical Center campus. Hospitals affiliated with Georgetown use the Library Information System to submit requests to borrow materials from the Dahlgren Memorial Library. Both the Hospital Information System and the Faculty Practice Plan use electronic tapes to transfer patient data to Blue Cross/Blue Shield. An anesthesia database has been developed by the department of Anesthesia in conjunction with the National Institutes of Health's Clinical Center.

5. Availability of Human Skills for Academic Information Problem-Solving: Individuals with expertise in programming, database development, and systems operations were identified during the Self Study process. Two online search options of the Self Study Inventory Database permit easy location of individuals and departments with skills in software and database development for consultative purposes. The pool of individuals with skills for academic problem-solving at Georgetown is large. Over twelve departments/divisions currently utilize 30 internal staff members for programming. The Self Study Inventory Database will ensure that individuals within this pool can be readily located and that information on available human resources remains current.

Key individuals nationally known for their accomplishments in the field of automation are Robert S. Ledley, D.D.S., Louis S. Rotolo, M.E., Winona C. Barker, Ph.D., William R. Ayers, M.D., Alan E. Zuckerman, M.D., Donald Segal, Walter Bechtold, D.D.S., and the Principal Investigator. Plans are to recruit a technically competent and knowledgeable individual to serve as Network Manager of the Medical Center's integrated system.

Methodology

The methodology for the Self Study included an inventory of existing systems. Each of the five operating units of the Georgetown University Medical Center (Schools of Dentistry, Medicine and Nursing; the Hospital; and the Library) engaged in a detailed self-study analysis covering seven basic aspects:

- technologies now in use, including both hardware and software;
- word processors and text editors used for manuscript preparation and publications;
- intra- and inter-institutional communication and data exchange;
- human resources and skills;
- existing networks and automated databases;
- information gatekeepers;
- use of networks by faculty, students, staff and practitioners.

In addition, each operating unit outlined information management needs and requirements for both short and long-range planning.

The Self Study was designed with both a retrospective and prospective component. With the completion of the initial inventories in early spring, the retrospective portion of the Self Study was achieved. The Medical Center now has an in-depth list of equipment, technologies, databases, and expertise currently available. This data serves as a clear indication of what the Medical Center has accomplished to date as well as a planning tool for future achievements. The prospective portion of the Self Study is currently underway. It involves periodic updates to the inventories and tracking of new technologies on an ongoing basis so that the Medical Center can continue to plan realistically for future needs.

Inventory Process

A Self Study Inventory of the technological capabilities of all Medical Center units, departments and divisions was undertaken in a two-step process. A brief, one-page survey was prepared and mailed to 40 departments under the auspices of the Medical Center Computer Committee. The purpose was to identify those departments with word processing,computer and/or networking capabilities. (See Appendix 5.) A total of 33 departments/divisions were selected from the respondents to the brief questionnaire for follow-up interviews. Additional departments/divisions were later added to the interview list, as new computing facilities were identified.

During the second phase of the inventory, members of the IAIMS Information Team conducted 48 in-person interviews utilizing a structured interview guide to complete the process. Twelve preliminary interviews were conducted in early January and the results checked for clarity and consistency. The interview guide was then slightly revised and a briefing session held for all members of the Information Team involved in the interviewing process. (See Appendix 6.) Each interview lasted approximately 1 to 1 1/2 hours and covered the following topics in-depth: equipment, automated files and databases, networking capabilities, external computer services, personnel, and library services. Target completion date for all interviews was January 30, 1984. The following departments/divisions participated in the detailed Self Study interview process:

Anatomy
Anesthesia
Biochemistry
Chancellor's Office
  Administrative
  Radiation Control
Coagulation Laboratory
Clinical Laboratories
Community and Family Medicine
Community Dentistry
Dahlgren Memorial Library
Dental School
  Clinic
  Dean's Office
  Student and Academic Affairs
  Student Services
Educational Media
Emergency Medicine
Emergency Medicine—Poison Center
Hospital Information System
  Administrative Office
  Operations
Immunology
Lombardi Cancer Center
Medical School
  Admissions and Records
  Associate Dean, Students
  Associate Dean, Undergraduate
  Continuing Medical Education
  Controller
  Faculty Practice Plan
  Financial Aid
  Sponsored Programs
Medicine
  Administrative Office
  Ambulatory Medical Services
  Billing and Collection
  Cardiology
Microbiology
Neurology
Nursing School—Graduate Programs
Obstetrics and Gynecology
Ophthalmology
Oral Diagnosis
Pathology
Pediatrics
Pharmacology
Physical Medicine and Rehabilitation
Physiology/Biophysics
Psychiatry
Radiation Medicine
Radiology
Surgery

Development of Self Study Inventory Database

Once the interviewing process was completed, plans for tabulating the data collected were made. A unit record based on the outlines of the structured interview guide was designed so that the interview data could be compiled into an online database. (See Appendix 7 for sample unit record.) The following fields were included in each department/division's record:

- types, manufacturers, and models of computer equipment
- programming languages
- operating systems
- applications and utility software
- equipment costs
- types of files (patient education, bibliographic, experimental, etc.)
- nature of files (confidential, commercially-acquired, etc.)
- systems accessed externally
- networking capabilities

Programs for inputing data into the Library's minicomputer and for updating records were then created. A guide for data entry was also prepared for keyboarding personnel and initial data entry was completed by May 1, 1984.

Summary Reports: The next step in the development of the Self Study Database involved the creation of report and search programs. The interview process had been designed to inventory both current Medical Center computer and communications equipment and projected information needs and goals. The Self Study Database was designed to organize interview data into a useful planning tool. Initially, seven sets of summary reports were created from the Self Study Database to permit Medical Center administrators to assess equipment compatibility and electronic communications potential across the Medical Center campus. These summary reports can be updated any time unit records within the Self Study Database are revised. These seven sets of reports include the following information:

1) **Equipment Summary Cumulation**—a breakdown of 10 types of computer equipment for the entire Medical Center, including quantities and number of departments holding any particular type of equipment; provides total figures for planning personnel at a glance.
2) **Equipment Summary by Departments/Divisions**—summarizes departmental data on equipment in a single chart; permits easy identification of departments/divisions which are heavily automated or vice versa; allows for comparisons at a glance.
3) **Equipment Summary within Department/Division**—provides detailed data on each department/division included in the Self Study Database; information is summarized from the unit record and, consequently, easier to read.
4) **Equipment Summary by Manufacturer/Model**—a breakdown by manufacturer and model of the following 9 types of equipment: word processors, microcomputers, minicomputers, mainframes, terminals, printers, modems, video monitors, and barcode readers; allows planning personnel to identify heavily used equipment by manufacturer and to assess equipment compatibility across the Medical Center campus.
5) **Software Summary by Hardware Type**—summarizes utilization of various types of operating systems, programming languages, and applications software by Medical Center staff; breakdown allows for analysis by type of computer-micro, mini, or mainframe.
6) **Networking Summary Cumulation**—outlines Medical Center use of external computer systems and lists on-campus networking programs. The data contained in this report will further permit planning personnel to develop an IAIMS network utilizing existing Medical Center resources with standardized access procedures instead of standardized hardware configurations.
7) **Networking Summary by Departments**—provides summary data on networking at the departmental level; permits comparisons between departments.

(See Appendix 8 for sample reports.)

Online Search Programs: The Summary Reports generated from the Self Study Database were designed to serve as a general Medical Center planning tool. Seven online search programs have been designed to supplement these reports and to serve as planning tools on a departmental/divisional level. In addition, these programs should foster resource-sharing among departments and promote collegial networking of expertise. Online search programs for equipment and software permit individual departments, who are planning equipment or software purchases, to locate on-campus users of similar items. An informal forum should result in which any particular drawbacks or advantages of an item are discussed prior to purchase. This forum, supplemented by the comparative cost data available through the online search for equipment, should also discourage the unnecessary purchase of duplicate equipment and encourage joint software purchases. Online search of in-house programmers and automated databases allows the easy identification of individuals and departments with special knowledge in software and database development for consultative purposes. Once easily identifiable, equipment and databases already available on the Medical Center campus should be more fully utilized and cooperative projects encouraged. Online search of information policy and networks provides valuable data for creating electronic links among Medical Center departments and for establishing access protocols with regard to fees and security.

Online search options include the following:

1—Search on Equipment

2—Search on Software

3—Search on Library

4—Search on In-house Programmers

5—Search on Automated Databases

6—Search on Information Policy

7—Search on Networks

Database Update Mechanism: The initial inventory data for the Self Study Database had been gathered in January 1984. As online search and summary reports began to take shape, it became clear that this data would need to be updated shortly. On July 24, 1984, a copy of each department/division's unit record and Summary Equipment Cumulation Report was mailed to participants in the Self Study Database for review and updating. As a result of this mailing, forty of the forty-eight records currently in the database have been updated. It is significant to note that since results were first tabulated in early June, there has been approximately a 25% increase in the number of microcomputers owned by Medical Center departments/divisions. On-campus computer capabilities are growing rapidly.

The updating process was valuable to the database development team for several reasons. First, it provided them with a basis for establishing routine procedures for tracking new equipment purchases, database development trends, and networking programs. Second, the favorable reaction to the updating process reiterated the need for both regularly-scheduled updates and for public access to the Self Study Database. Plans for updating the database on a regular basis and for making it available to Georgetown users are currently under development. In the public search phase, individuals accessing the Self Study Database will not be allowed to edit or add records nor will they be permitted to update Summary Reports. The database itself will be presented in a user-friendly, menu-driven format which requires little training to use. Periodic updates will ensure that the Self Study Database is an effective planning tool from both a retrospective and prospective viewpoint.

Functional Academic Information Management Goals

Introduction

The Self Study was designed not only to identify existing computer resources on the Medical Center campus but also to determine how these resources could be utilized to build an IAIMS network which would meet management goals of the Medical Center. Consequently, a basic objective of the Self Study involved the determination of functional academic information management goals. A four-step process was used to attain this objective:

(1) To gather information on present systems and functional goals for future development of each Medical Center unit;

(2) To chart the flow of information between functional units;

(3) To identify technologies that could improve productivity, effectiveness, and economy of these functions;

(4) To project the impact of potential applications of information technologies.

Needs Assessment

The Self Study was designed to identify existing computer resources on the Medical Center campus, to determine how these resources could be utilized in an IAIMS network to meet functional and management goals of the Medical Center, and to chart the flow of information between functional units (See Figures 1-5). Present computer and communications systems were inventoried and, in addition, every department/division interviewed in the self study was also asked to review its future automation goals. These goals generally fell into two broad categories: internal and external. The internal goals tend to be department-specific. For example, Anesthesia and Radiation Control need automated files for their respective inventories and use of these files would be primarily intra-departmental. External goals are more general and often have wide applicability throughout the Medical Center. Several departments expressed interest in a computerized reservation system for lecture space and in local area networks for improved campus communications. External goals also generally involve sharing of resources across departments and divisions.

Most departments and divisions interviewed had similar priorities for internal goals, ranked in the following order:

- automation of internal functions, beginning with word processing;
- creation of automated departmental files or, alternatively, expansion of existing automated files;
- development of electronic links to external departments and databases.

In addition to the self study inventory data, several brainstorming sessions were conducted at planning retreats to "dream up" scenarios of how information might best be accessed, utilized, delivered and shared. The ground rules for the discussion encouraged planners and users to think primarily of information needed and not be hampered by systems or processes. A number of use scenarios were developed, applicable to the IAIMS architecture.

Information Use Scenarios

1. Dealing with the medically compromised patient in the dental clinic.

   SOLUTION: a. Online access to medical history
   b. Consultations with medical colleagues through electronic communication
   c. Current articles on patient management via online bibliographic or full-text databases

2. Coordinating medical students and residents working at eleven affiliated hospitals in the metropolitan DC area.

   SOLUTION: a. Teleconferencing for educational programs
   b. Remote consultations with specialists at Georgetown through electronic means

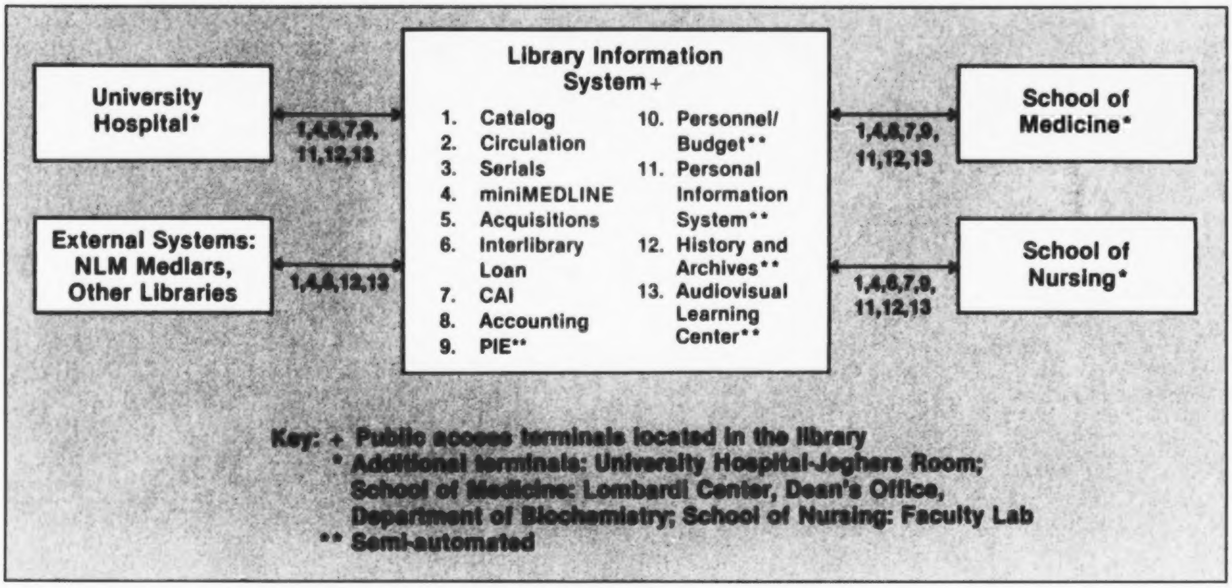
3. Signing off on medical records from a remote site by a clinical practitioner.

   SOLUTION: a. Online access to patient records to review tests ordered by resident
   b. Ability to order additional tests, if needed
   c. Review patient management and complete the medical record

System Functional Requirements

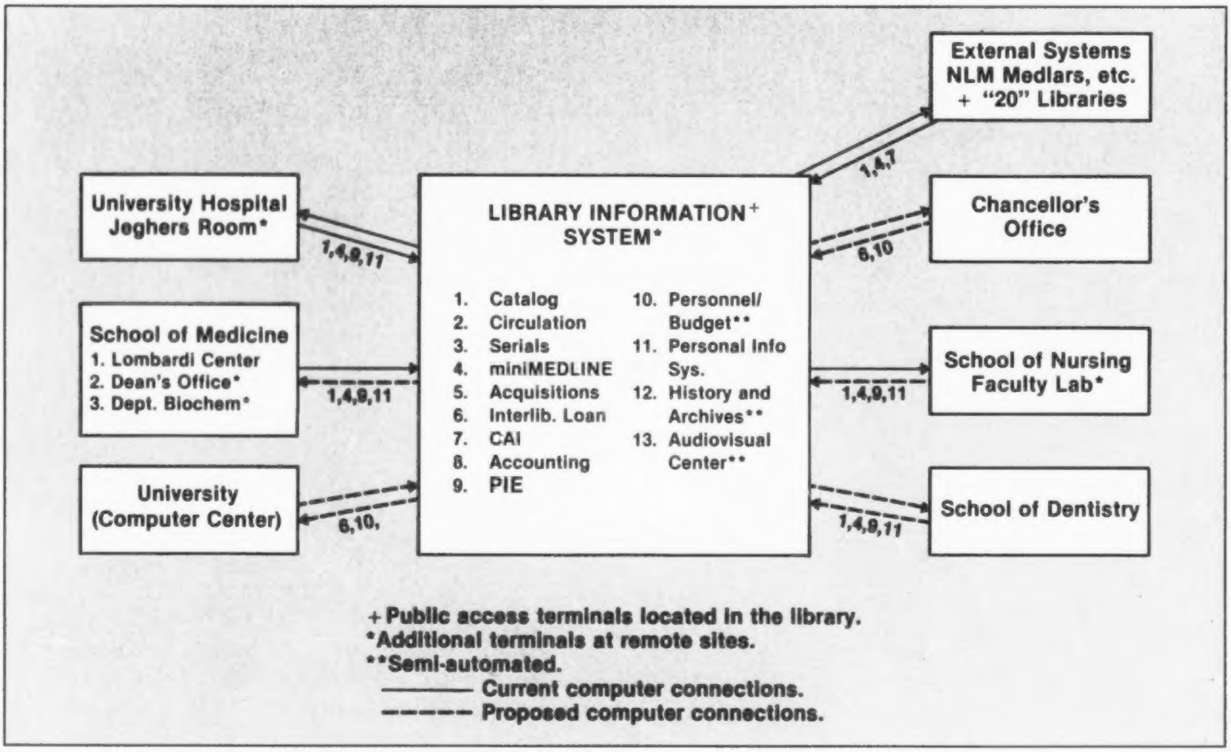
1. **Hardware and Software Needs:** Establishment of an electronic office is a top priority in many departments throughout the Medical Center. Departments and divisions, such as Cardiology and

FIGURE 1
Current Information Flow
Dahlgren Memorial Library Automated Information Systems


Library Information System +
1. Catalog
2. Circulation
3. Serials
4. miniMEDLINE
5. Acquisitions
6. Interlibrary Loan
7. CAI
8. Accounting
9. PIE**
10. Personnel/ Budget**
11. Personal Information System**
12. History and Archives**
13. Audiovisual Learning Center**
University Hospital*
1,4,6,7,9, 11,12,13
External Systems: NLM Medlars, Other Libraries
1,4,6,12,13
School of Medicine*
1,4,6,7,9, 11,12,13
School of Nursing*
1,4,6,7,9, 11,12,13

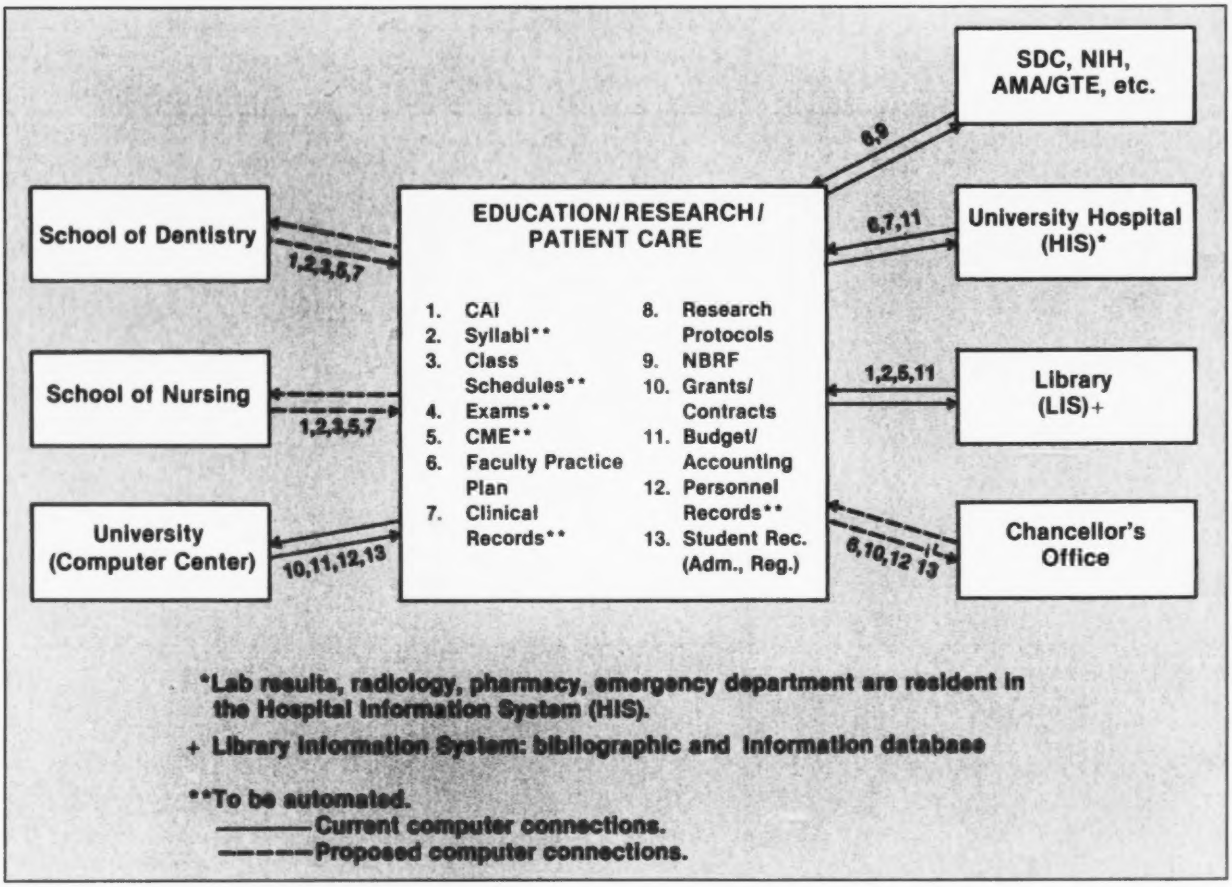
Key: + Public access terminals located in the library
* Additional terminals: University Hospital-Jeghers Room; School of Medicine: Lombardi Center, Dean's Office, Department of Biochemistry; School of Nursing: Faculty Lab
** Semi-automated

FIGURE 2
Information Flow
Dahlgren Memorial Library Information System


LIBRARY INFORMATION + SYSTEM*
1. Catalog
2. Circulation
3. Serials
4. miniMEDLINE
5. Acquisitions
6. Interlib. Loan
7. CAI
8. Accounting
9. PIE
10. Personnel/ Budget**
11. Personal Info Sys.
12. History and Archives**
13. Audiovisual Center**
University Hospital Jeghers Room*
1,4,9,11
School of Medicine
1. Lombardi Center
2. Dean's Office*
3. Dept. Biochem*
1,4,9,11
University (Computer Center)
6,10,
External Systems NLM Medlars, etc. + "20" Libraries
1,4,7
Chancellor's Office
6,10
School of Nursing Faculty Lab*
1,4,9,11
School of Dentistry
1,4,9,11

+ Public access terminals located in the library.
*Additional terminals at remote sites.
**Semi-automated.
——— Current computer connections.
– – – – Proposed computer connections.

FIGURE 3
Information Flow
School of Medicine


SDC, NIH, AMA/GTE, etc.
6,9
School of Dentistry
1,2,3,5,7
EDUCATION/ RESEARCH/ PATIENT CARE
1. CAI
2. Syllabi**
3. Class Schedules**
4. Exams**
5. CME**
6. Faculty Practice Plan
7. Clinical Records**
8. Research Protocols
9. NBRF
10. Grants/ Contracts
11. Budget/ Accounting
12. Personnel Records**
13. Student Rec. (Adm., Reg.)
6,7,11
University Hospital (HIS)*
School of Nursing
1,2,3,5,7
1,2,5,11
Library (LIS)+
University (Computer Center)
10,11,12,13
6,10,12 13
Chancellor's Office

*Lab results, radiology, pharmacy, emergency department are resident in the Hospital Information System (HIS).

+ Library Information System: bibliographic and information database

**To be automated.
——— Current computer connections.
– – – – – Proposed computer connections.

Radiology, which use computerized tools for patient care, already tend to have highly automated offices. Departments in the Dental School appear to be the least automated and do not yet have a strong framework for networking such as that provided by the Hospital Information System and the Faculty Practice Plan for the hospital and clinical medical faculty. There is widespread interest across the Medical Center for certain types of databases. Nearly every department/division stated that current clinical and experimental databases are inadequate. Much work needs to be done in automating complete patient records, integrating inpatient and outpatient files, providing patient demographic data, and creating computer files for protocols and clinical trials. Medical Center researchers expressed an interest in acquiring a powerful statistical program with graphic capabilities to manipulate and analyze experimental data.

2. **User Access:** All departments/divisions expressed interest in having access to the Library Information System's Online Catalog and mini-MEDLINE SYSTEM. Many want online access to a variety of University records to meet external goals. These include records maintained by Accounting, the Registrar's Office, the Financial Aid Office, Sponsored Programs, and the Central Computer Facility (CCF). Only three offices—the Chancellor's, the Controller's, and the Librarian's—currently have online access to the CCF. Yet student grades, test scores, financial data, and personnel records for much of the Medical Center are maintained at the CCF. Several departments, including Pediatrics and Community and Family Medicine, have mounted special databases on the CCF which generally must be searched offline. The widespread interest in online access clearly indicates the need for increased linkages through knowledge gateways, local area net-

works and a campus-wide telecommunications system.

3. **Educational and Training Resources:** Departments/divisions involved in teaching expressed interest in an additional set of files such as computer-assisted instruction, knowledge databases, student demographics, online syllabi and continuing education programs. Additional sugestions regarding automation and communications at the Medical Center included an online directory of Medical Center computer and software resources, and the creation of a position for an in-house information resources expert. Both consulting and the sharing of expertise will play an important role in meeting the internal needs of each Medical Center department/division. Many departments/divisions do not currently know how to automate files, while other departments/divisions are duplicating the already successful efforts of colleagues.

In summary, the functional management goals of the Medical Center will be more readily met through improved interdepartmental communications, increased access to a variety of University records, and the development of general databases for administrative support. These are outlined below:

Patient Care/Research Needs

Automated patient records
Automated pharmacy
Clinical databases
Computerized billing (for departments not on Faculty Practice Plan or HIS)
Drug interactions online
Electronic access to Blue Cross/Blue Shield
Expanded tumor registry
Experimental databases
Funding sources online
Patient demographics
Statistical package with graphics capabilities

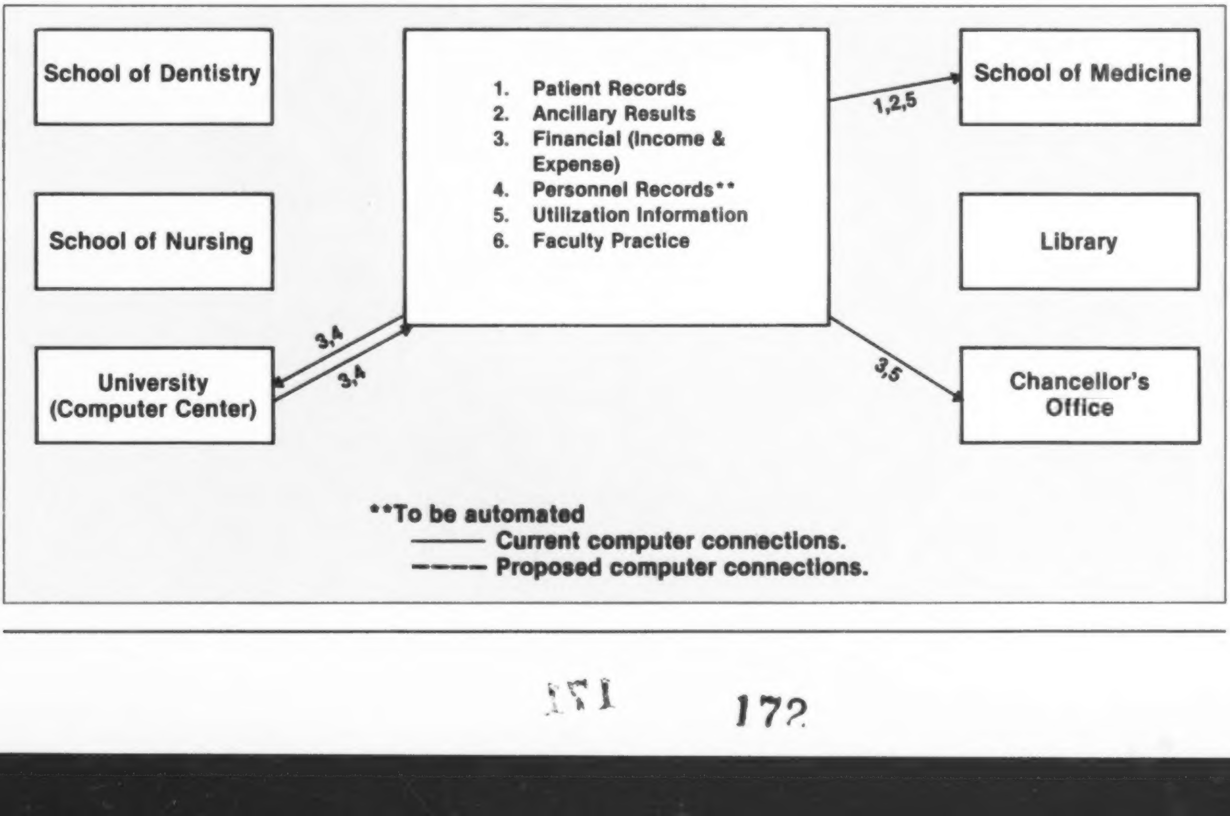
Direct access needed to:

Accounting
Central Computer Facility (CCF)
Dahlgren Memorial Library
Outside bibliographic utilities
Purchasing
Sponsored Programs

Student/Teaching Needs

Computer-assisted instruction
Computer reservation system for lecture space, other facilities

FIGURE 4
Information Flow
University Hospital Information System


School of Dentistry
School of Nursing
University (Computer Center)
1. Patient Records
2. Ancillary Results
3. Financial (Income & Expense)
4. Personnel Records**
5. Utilization Information
6. Faculty Practice
School of Medicine
Library
Chancellor's Office
1,2,5
3,4
3,4
3,5
**To be automated
——— Current computer connections.
- - - - Proposed computer connections.

Continuing Education Programs online
Knowledge databases
Syllabi online (to avoid duplication of course content)

Access needed to:

Biographic data on faculty and clinical staff
Financial Aid Office
Registrar's Office
Student demographics
Test scores in CCF

Identification of Technologies*

The IAIMS concept seeks to extend and enhance the utilization of recorded biomedical knowledge. The intent, as it relates to the Georgetown University Medical Center, is to improve the transfer and management of academic information through a distributed network system that uses advanced computer and communication technologies. The physical components of an IAIMS will include access devices, information resources, processing hardware and a transmission network, such as those outlined below:

Access Devices:
- telephones
- workstations
- computers
- video cameras/displays/recorders

Information Resources:
- databases
- processes
  - (CAT scans, laboratory tests, x-rays, etc.)
- people

Processing Hardware:
- mainframe computers
- minicomputers
- microcomputers

Transmission Network:
- voice
- data/text
- image

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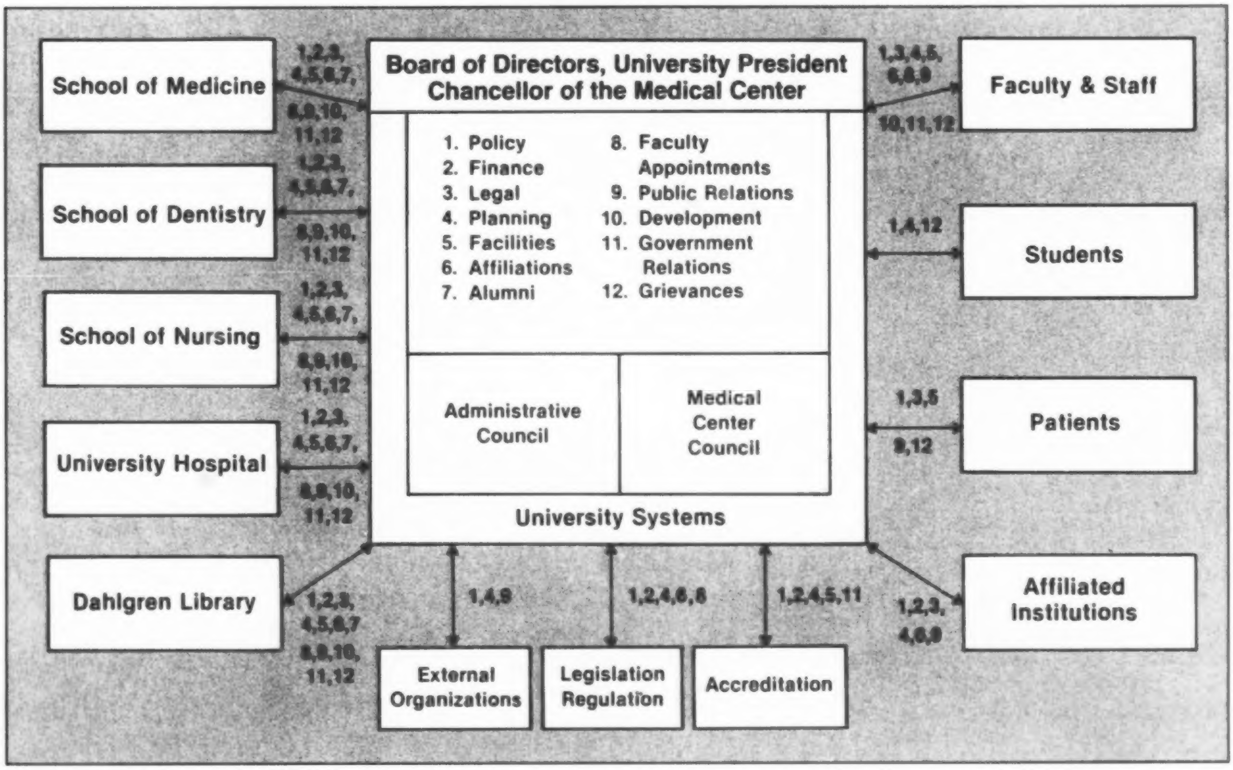
*Prepared by Sigma Associates as a subcontract.

FIGURE 5
Information Flow


School of Medicine
1,2,3, 4,5,6,7, 8,9,10, 11,12
Board of Directors, University President
Chancellor of the Medical Center
1,3,4,5, 6,8,9 10,11,12
Faculty & Staff
School of Dentistry
1,2,3, 4,5,6,7, 8,9,10, 11,12
1. Policy
2. Finance
3. Legal
4. Planning
5. Facilities
6. Affiliations
7. Alumni
8. Faculty Appointments
9. Public Relations
10. Development
11. Government Relations
12. Grievances
1,4,12
Students
School of Nursing
1,2,3, 4,5,6,7, 8,9,10, 11,12
Administrative Council
Medical Center Council
1,3,5 9,12
Patients
University Hospital
1,2,3, 4,5,6,7, 8,9,10, 11,12
University Systems
Dahlgren Library
1,2,3, 4,5,6,7 8,9,10, 11,12
1,4,9
1,2,4,6,8
1,2,4,5,11
1,2,3, 4,6,9
Affiliated Institutions
External Organizations
Legislation Regulation
Accreditation

As the link among access devices, information resources, and processing hardware, the transmission network is the most important consideration for planning an IAIMS. It is the purpose of a transmission network to share information more effectively by moving it more efficiently, for instance, from workstation to mainframe to end-user. Decisions made during the planning stage for a transmission network will affect the future course of an IAIMS. Key questions concern the location of both processing power and information resources. Should databases be centralized or decentralized? Should processing hardware be centralized or distributed? The Medical Center's decision to build an IAIMS utilizing resources currently in use favors a distributed approach to both database and processing hardware location. A distributed approach in turn necessitates a highly-sophisticated transmission network. Devices used to access the transmission network must be standardized to some extent. The degree of standardization also has a significant impact on the future course of an IAIMS. Access devices with little standardization among classes require more intelligence within the IAIMS network to ensure interoperability than do standardized devices. However, highly standardized devices reduce the networks' ability to adapt rapidly to technological changes.

Due to the importance of the transmission network within an IAIMS, a careful study was made of possible network characteristics. Four physical transmission media are currently available for networking—twisted wire pair, coaxial cable, optical fiber, and space. Three switching methods may be used in conjunction with these media—circuit, packet, or message. The network itself can be structured in star, loop, ring, bus, or hybrid configurations. Control methods for transmission medium include the following: trunk/contention, FDM/TDM, CSMA/CD, token passing, and TDMA/DAMA.

A final decision regarding transmission network characteristics involves not only the technologies available but also an analysis of applications, equipment capabilities, environmental factors, and cost considerations. Each of the following must be carefully studied:

- nature of traffic to be carried
- bandwidth needed
- geographic dispersion
- connectivity required
- physical environment
- performance needs
- projected growth

Three types of traffic are likely to be carried through the transmission network of an IAIMS—voice, data/text, and image. Currently, separate technologies exist to handle each. Voice traffic is generally carried over twisted pair-circuit switching-trunk/port-contention star configurations. Data and text are usually carried over local area networks (LAN's) or, alternatively, via a digital PBX system. To date, image transmission has been most successful using broadband local area networks. Currently, there is no single technological alternative capable of supporting all of the network transmission requirements of a long-term IAIMS. Interconnection is near (i.e. PBX with integral LAN interface) but not complete integration. The charts below outline the advantages and disadvantages of each of these technologies.

Voice: Centrex vs PBX

Centrex Pro's	**PBX Con's**
Telephone company operated and maintained	Customer operated and maintained (additional people and expertise required)
Reliability/performance	Customer provided space/power/insurance/etc.
Centrex Con's	**PBX Pro's**
Telephone company controlled resource	Customer controlled resource
Weak transmission capabilities (maximum 4800bps with modems)	Features/function of electronic sets
Impact of divestiture (AT&T/BOC)	Integrated voice/data; distributed switching/concentration; concentration; non-blocking
Life cycle cost ($/station/mo) Today: $27-30	Life cycle cost ($/station/mo) Today: $22-25 (5 year lease)
Access fee impact: $2 existing station/$6 new station	Access fee impact: $.75-1.50 per station
Moves and changes: $100-150 per	Minimal incremental cost

CONCLUSION: Customer based PBX has superior architecture (i.e. AT&T System 85, Rolm CBX, Intecom IBX)

Voice: Digital vs Analog PBX

- Trend to digital transmission facilities will eventually provide the Digital PBX with significant product advantages (feature and function); information to be moved will be in digital form as created, stored, etc.
- Proliferation of data devices and price performance advantages of digitally encoded switching matrices will make digital PBX lowest cost approach:

Voice only: $500-800 per station
Modems: $1.25 per station
1200 bps $ 500-1000
2400 bps $1200-2200
4800 bps $3000-5000
Voice/data: $900-1200 per station (up to 56kbps)

CONCLUSION: All PBX's will be digital in the near future. The analog PBX is a dinosaur.

Data: Digital PBX vs LAN

Digital PBX Pro's	LAN Con's
Cost:	**Cost:**
Voice and Data: $900-1200 per station	Data only: $800-1000 per device
Distributed architecture to support campus environment	Non-full period up to 56kbps data (Baseband)
Integrated voice/data; distributed switching/concentration; non-blocking	May be partially or totally disrupted in event of cable failure
Reliability	
Switched data up to 19.2 kbps async and 56 kbps sync without modems	

Digital PBX Con's	LAN Pro's
Non-full period up to 56kbps data	Full period up to 6 MHz device operation (Broadband)

CONCLUSION: Digital PBX superior for other than very high speed or full period applications. For these requirements broadband LAN is the only current architectural alternative.

Image: Baseband vs Broadband LAN

Baseband (no carrier)	Broad (modulated carrier)
Ungermann-Bass, Datapoint ARC	WangNet, Amdax, IS/3M
Coaxial cable/fiber optics, packet switching, CSMA/CD, Bus	Coaxial cable/fiber optics, circuit switching, FDM, Bus
1 to 10 Mbps	10 to 300 Mbps
Proprietary/non-proprietary	CATV based architecture capable of supporting video transmission
Full interconnectivity User programmable	

Impact of Potential Applications of Information Technologies*

The communications technologies most likely to have a significant impact on an IAIMS network are a campus-based digital PBX system for voice and data transmission and a broadband local area network for image transmission. A campus-based digital PBX system will provide integrated voice/data capabilities, distributed control/switching, twisted wire pair between station devices and switching units, and optical fiber connections between switching units. A broadband local area network will offer video, high speed data, and full-period data applications through its optical fiber/coaxial cable base.

Processing power for an IAIMS network will generally be distributed in an effort to build upon and utilize more effectively existing Medical Center hardware. It is expected that more and more end users will rely on personal computers. The decentralized approach is highly desirable because the functional units already have in place a successful working mechanism. The distributed approach to processing is possible through the implementation of a highly-sophisticated transmission network such as that described above. The advantages and disadvantages of distributed and centralized processing have been considered from a variety of approaches and are listed below:

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*Prepared by Sigma Associates as a subcontract.

Processing Power

Distributed Pro's	Centralized Con's
Cost/performance at end user level	Complexity (difficult to change, tailor, and expand)
Flexibility for change and expansion	Vulnerability to single-point failures
Supports current organizational culture	Possible performance problems (i.e. response time)

Distributed Con's	Centralized Pro's
Results in duplication (software, equipment)	Economy of scale benefits at campus level (operations, equipment, development)
Thwarts interoperability (potential anarchy)	Enhances interoperability
Difficult to protect privacy and security	Simplifies protection of privacy and security

The nature of the databases already developed on the Medical Center campus favors a distributed systems approach. Many of the automated files currently in use are highly specialized, department specific, or confidential in nature. These types of data are not readily consolidated into a centralized file. A sophisticated transmission network across the Medical Center campus will permit the sharing and transfer of data among these files as needed. Databases with broad appeal and wide applicability could possibly be centralized. Administrative support files, such as those housed in the purchasing and accounting offices, might fall into this category. However, decentralization of files for most of the Medical Center is preferred for reasons outlined in the chart below:

Database Location

Decentralized Pro's	Centralized Con's
Supports current organizational culture	Complexity as size and number of relationships increase
Improved access performance	Vulnerability to single-point failures
Less vulnerable	Performance of large number of simultaneous accesses

Decentralized Con's	Centralized Pro's
Difficult to protect	Simplifies data integrity, security, and privacy
High technical risk relative to successful implementation	Low technological risk relative to successful implementation
Duplication increase cost (storage, software)	Economy of scale benefits (maintenance, development, storage)

The IAIMS transmission network will need to be standardized to the extent that it can support interoperability among communities of interest. Such an approach is essential to the successful operation of the decentralized and distributed components of the IAIMS. Standardization will occur on the following levels: physical interface, transmission link, personal computer operating system, and database management system. Standardization will enhance interoperability among IAIMS components and permit the initial creation of a streamlined transmission network. Three problems must be studied during the standardization process. First, the transmission network's ability to incorporate technological change must be studied. Flexibility is a key aspect of a highly-sophisticated transmission network. Second, a method of overseeing and maintaining standardization procedures must be devised. Third, departmental/divisional autonomy with regard to internal operations must be preserved.

Short and Long Range Information Management System Requirements*

Introduction

The major goal of an IAIMS is to improve the transfer and utilization of biomedical knowledge for better health care delivery and education of health practitioners. To achieve this it will be important for Georgetown to bring into useful conjunction the diverse academic information resources within the Medical Center, to develop an implementation plan that utilizes a wide range of information technologies, and to incorporate a number of use scenarios. This can best be accomplished by maximizing available technologies (telecommunications/computers/office systems, etc.), by minimizing risks through careful migration of proven technologies with newer systems, and by introduction of innovative programs as "pilot" projects.

Approach

In its Strategic Planning Process, Georgetown has incorporated a three stage, phased approach for the establishment, implementation and ongoing enhancement of the IAIMS:

Pilot	1-3 years
Interim	3-5 years
Long-Range	5-10 years

In the Pilot Stage, this multiphasic program will begin by establishing connections for approximately 50 workstations in the first year and building up to approximately 1,000 in the third year. In the Interim Stage, the program will expand to allow access throughout the entire Medical Center wherever terminals or computers are available. The Long-Range Stage will ultimately extend access to external sites, including community health practitioners, local hospitals and academic medical centers affiliated with or participating in consortial arrangements with Georgetown University.

Pilot IAIMS: The focus for the Pilot IAIMS will be on education with use by practitioners at the undergraduate, graduate and postgraduate levels, bringing value to patient care and research. Projects selected should have maximum appeal and use and should serve a broad community of interest. There should be no major developmental efforts, little risk, small dollar outlay, and minimal policy impediments. All pilot projects should be defined in the context of the Long-Range IAIMS implementation. Pilot IAIMS projects should be measurable in the short term and should have a short implementation cycle. It is critical for the Pilot IAIMS to broaden the information resources aready available at Georgetown, the user base, and the techniques for access.

The Pilot IAIMS scenarios provide for expanded information resources beyond the LIS (Library Information System) and the HIS (Hospital Information System), expanded access to the information resources for students, faculty and practitioners, development of clinical databases, and development of plans for an Academic Information Management Center (AIMC). The implementation cycle for the Pilot IAIMS should take into account that it will use a shared processor-based system, will subsidize student owned personal computers, and will rely on the existing telephone system for transmission at low speeds (less than 9600 bps). The Pilot IAIMS will be characterized by 4 to 6 online databases, 40 to 60 electronic devices and 1 to 2 minicomputers, a common network access protocol, access on a port contention basis (not dedicated), and a non-intelligent network as a transmission medium only.

Interim IAIMS: The second Stage or Interim IAIMS can be operational within 3-5 years and will be the beginning of useful conjunction of academic information resources within the entire Medical Center. Successful Pilot IAIMS projects can be enlarged and expanded to increase the scope and accessiblity to an even broader user base. Current technology, products and services can be upgraded as newly proven alternatives are established. This will require some evolutionary changes in current policy and "culture." During this phase, new projects can be introduced, either building from existing ones or totally new in scope. Both will be introduced via a pilot mode, until proven successful.

The scenarios envisioned for the Interim IAIMS include greatly expanded information resources and access, new uses of information, the establishment of an IAIMS Program Office, and the establishment of an Academic Information Management Center within the Library. The projected Interim IAIMS will be characterized by 40 to 60 databases available online to Georgetown users, 500-1,000 electronic devices, and 5-8 minicomputers interacting in the network with a common network access protocol.

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*Prepared by Sigma Associates as a subcontract.

Long-Range IAIMS: The full blown IAIMS will be operational within 10 years and will have all information available in electronic form—voice, image, text and data. Information resources will be accessible from a minimum set of electronic devices and there will be no geographic restrictions. Information will be available across Medical Center units regardless of the degree of decentralization and acceptable controls will be in place for access and changes. Available information will be internally and externally generated; internally produced information resources will be made available to other institutions.

Potential Impact on the Georgetown Mission

An analysis has been made on the potential impact of the IAIMS on the nine major goals and related tasks for the Georgetown University Medical Center Long Range Plan, 1983-1987. The degree of impact on the goals and objectives of the Medical Center has been weighted to indicate a high, medium or low impact.

Goal I: To promote and enrich the environment for the academic scholarly and service activities of the Medical Center.

Task	Degree of IAIMS Impact
A. Study opportunities to improve Georgetown University Medical Center academic environment.	Low
B. Development of Library collections, facilities and programs.	High
C. Computer systems coordination.	High

Goal II: To maintain and improve excellence in academic instruction and learning.

Task	Degree of IAIMS Impact
A. Continued departmental and program reviews and planning.	Low
B. Planning for faculty, staff, and student resources.	Medium
C. Mantain superior quality of graduate educational programs.	High
D. Enhance continuing education for health professionals.	High

Goal III: To sustain and improve the research effort at the Medical Center.

Task	Degree of IAIMS Impact
A. Seek further research programs and financing.	Medium
B. Research facilities planning.	Low
C. Seek to recruit, train and retain research faculty.	Low

Goal IV: To enhance clinical and community services recognizing that patient care is a mission of the Medical Center equal in importance to education and research.

Task	Degree of IAIMS Impact
A. Market analysis.	Medium
B. Expansion of patient referrals.	Medium
C. Clinical sciences ambulatory facility.	Low
D. Faculty Practice Plan Expansion.	High
E. Complete master plan for hospital facilities upgrading.	Low
F. Study of various corporate organizational models.	Low

Goal V: To continue to actively promote affirmative action and equal opportunity for students, faculty and staff.

Task	Degree of IAIMS Impact
A. Recruitment, promotion and retention of female and minority faculty and staff.	Low
B. Minority recruitment for Medical, Dental and Nursing students and Hospital interns, residents and fellows.	Low
C. Opportunities for the handicapped.	Low

Goal VI: To maintain and improve Medical Center management and financial effectiveness as a major method of sustaining fiscal solvency.

Task	Degree of IAIMS Impact
A. Cost containment, shared resources and revenue production.	High
B. Develop additional financial modeling systems.	High
C. Expand managerial skills at organizational levels.	Medium
D. Development and capital acquisition activities.	Low
E. Student financial assistance.	Medium
F. Study financial implications of existing tenure policy at the Medical Center.	Low

Goal VII: To initiate and promote programs in personal health education.

Task	Degree of IAIMS Impact
Personal Health Education	Low

Goal VIII: To participate in the promulgation of local, regional, national and international health policy.

Task	Degree of IAIMS Impact
A. Health policy integration at the Medical Center.	Low
B. Assist with Medical Center Long Range Planning.	Medium

Goal IX: To continue to conduct and evaluate long range and strategic planning processes and outcomes for Georgetown University Medical Center.

Task	Degree of IAIMS Impact
A. Coordination of planning activities at the Medical Center.	Medium
B. Development of planning database.	High
C. Develop a contingency plan for each unit of the Medical Center.	Medium

Conclusion

The Self Study activity presented an opportunity to inventory Georgetown's resources—hardware, software and human—that will play a key role in implementation of an IAIMS. The planning teams have used these findings to identify future needs to make IAIMS a reality. From the needs assessment we have prioritized pilot projects for implementation within the short and long range goals.

The IAIMS concept of combining varied components of biomedical data such as bibliographic, clinical, research, educational, and management to make them accessible in an integrated approach is now substantiated by the interviews and the statistical data gathered during the Self Study.

The tasks ahead to implement an IAIMS represent an immense challenge. Georgetown does not have a communication's network in place, it has little or no experience in interfacing the existing computers, has minimal interdepartmental networks and has only recently considered the workstation concept with remote access. On the positive side, because of this, Georgetown can plan to use the latest technologies and state-of-the-art approaches as it moves toward integration.

Georgetown's strengths are associated with its existing sophisticated databases in the Library Information System and the Hospital Information System. They will be used as shared databases to provide the resources upon which the foundation of the future IAIMS will be built. Other databases such as education, research and management will be created as cooperative endeavors through the IAIMS.

Appendices

1. Excerpt from Georgetown University Faculty Handbook, 1983; Policy on Copyrights, Inventions, Patents and Grants.
2. Information Policy, Dahlgren Memorial Library, March 1984.
3. Issues Considered for an Institutional Information Policy, February 1984.
4. Discussion Guide for IAIMS Information Team, November 1983.
5. Survey of Automated Systems; one-page brief survey.
6. Interview Guide for Self Study Inventory.
7. Self Study Inventory Database, Unit Record for the Dahlgren Library.
8. Sample Summary Reports, Self Study Inventory Database.

Appendix 1

Faculty Handbook

1983

Georgetown University
Washington, D.C. 20057

Policy on Copyrights, Inventions, Patents & Grants

A. Copyright Royalties of Publications on Materials Authored by Faculty Members.

The University and the faculties are requested to do everything possible to encourge publication and research by staff members. The services of the Office of the University Editor, for example, are available, without fee. These services include advice on book contracts and the submission of faculty manuscripts to trade publishers.

In case of publication of teaching material by staff members in which the University pre-pays the full, or a substantial part of, the costs of such publication, special arrangements have to be made about the copyright and the division of royalty with the dean of the pertinent school as well as with the Treasurer of the University.

Copyrights which, for one or the other reason, are registered in the name of the University, especially in case of publication under government contract, may be transferred to the staff member, if such a transfer appears to be in the interest of the best utilization of such copyright.

B. Inventions and Patents

Faculty, staff members and employees of Georgetown University—hereinafter referred to as staff members—shall participate in the fruits of scientific research under the following principles:

I. Georgetown University acquires ownership in all inventions—any new and useful process or discovery, art or method, machine, manufacture, or improvement thereof—made or conceived by a staff member, provided such invention was made:

(a) during a special research assignment given to a staff member pursuant to a research contract or grant of the University or otherwise;

(b) in utilization of the facilities, equipment, funds or other contribuitons of the University;

(c) and provided that the University has not entered into a research grant or contract with express provisions to the contrary.

Inventions made by a staff member on his own time and wihtout aid of Georgetown University facilities are the sole property of the inventor.

(a) Patents from such inventions should be administered so as to not involve the name of the facilities of Georgetown University.

(b) Time spent in administering such patents should conform to the University policy on outside activities by staff member.

(c) In general a staff member should not patent such inventions which are in the specific field of Georgetown University's research programs without permission by the University.

(d) Inventor-owned patents may at the option of the inventor be assigned to Georgetown University for administration under University patent policies or in accordance with specific agreement between the inventor and the University.

II. Ownership and disposition of invention rights resulting from research financed wholly or partially by governmental, industrial, philanthropic or other organizations shall be determined by the rules, regulations, and procedures of the sponsoring organization and in accordance with the terms of the related research agreement and the policies of Georgetown University. A staff member who elects to perform research on governmental, industrial or other projects undertaken by the University is required to sign such supplemental agreements as are necessary to enable the University to fulfill its legal obligations with respect to patentable discoveries.

III. At the request of Georgetown University any member of the University staff who developed an invention under paragraph I(a), (b), or (c) or paragraph II shall be required to execute the papers required for making application for patents in the United States and abroad and for assignment of such patent applications or patents to Georgetown University or its designee. The expenses of the patent proceedings undertaken pursuant to this section are to be paid by the University or by its assignee.

IV. Georgetown University may dispose of its rights obtained under paragraph I, II and III as follows:

(a) by selling, or licensing, or assigning, or otherwise exploiting such rights;

(b) by operating such rights for public use, if principles of charity or public policy, in the determination of the University, so demand;

(c) by releasing such rights to the inventor, provided he repays expenses already incurred by the University or its assignee;

(d) by including such rights in a research contract with a third party under which such rights are, either in advance or subsequently, assigned or licensed to the third party or otherwise.

V. The member of the staff shall be paid one half of the net income resulting to the University under paragraph IV(a).

If disposition is made under paragraph IV(d), Georgetown University will do its best, in the interest of its staff members, to facilitate their participation in the income either directly from the third party or through participation in the income of the University.

VI. The members of the staff of Georgetown University are expected to cooperate in the following ways:

(a) They will maintain clear records from which the developments of research and of inventions can be proven.

(b) They will report to Georgetown University or its departments whenever, in their opinion, an invention, patentable or not, was made.

(c) They will assist the patent attorney designated by Georgetown University, or by the University's assignee, in the prosecution of the patent application.

(d) They will assist Georgetown University in its attempt to dispose of the rights resulting from inventions or patents.

(e) These obligations enumerated here remain effective even after the staff member shall leave the University.

Georgetown University will give all reasonable opportunity to the staff members to help in getting the most equitable arrangement in the interest of Georgetown University and of the inventor.

VII. Any dispute arising from the application of these principles shall be arbitrated in accordance with the procedure prescribed by the American Arbitration Association. The award rendered by the arbitrator shall be final and binding on both parties.

VIII. The conditions enumerated herein shall become part of each contract of employment with staff members.

IX. Notwithstanding the above provisions, the University may elect to contract with a patent management firm for such services in relation to patent applications and prosecutions as such organization offers. In augmentation of this policy, the University has entered into a patent development agreement with Research Corporation which will act as the University's patent management agency. Any net income which the University obtains from the sale or exploitation of an invention shall be shared with the inventor as indicated in paragraph V above.

Research Corporation is a non-profit foundation which distributes its total net income as grants-in-aid of research to colleges, universities, and scientific institutions. As stated in its charter, it was established to receive and to acquire inventions and to render the same more available and effective in the useful arts, to provide means for the advancement of scientific investigation by contributing the net earnings of the corporation to scientific and educational institutions, and to receive other monies and property and to apply the same to the objects specified.

C. Procedures for Research Grants or Contracts

1. When application for a research grant is to be made, a written outline of the project in question, approved by the appropriate Department Head, will be submitted to the Committee on Research and Graduate Study of the school. In the event of non-approval by the Department Head, the principal researcher shall retain the right to submit his project to the Committee on Research and Graduate Study of the School concerned for consideration jointly with the Head of the Department concerned. If such a committee does not exist, the project shall be submitted to the Dean. (In lieu of the written outline—the dean or committee of the school may accept the fully prepared project application for review.) This outline should be brief but should include definitive statements on the following points:

a. Statement of the Problem

b. Method of Approach

c. Requirements (equipment, time, personnel, space, etc.)

d. Reason, rationale or significance

e. Source of support (projected)

In its consideration of the above outlined projects, the committee or dean should determine if the project is scientifically sound, the approach is practicable, and that the interests of Georgetown University will be protected. By this is meant that basic and useful equipment may be obtained, commitments on personnel and space will not be burdensome to the school and that the academic reputation of the school will not be endangered by the nature of the work or the restrictions of the grantor.

2. Upon the approval of the committee, if one exists, the proposed project will be sent to the Dean of the school for his consideration.

3. In instances where an investigator conceives of a worthwhile project but lacks financial support, the grant request should be prepared as outlined above and sent through channels to the Dean.

4. The proposed project should then be written in the form required for grant application, and this presented to the Dean for forwarding to the Treasurer of the University with a letter or signature of approval written by the Dean. All grant applications must also bear the signature of the President or the Treasurer as contracting officers for the University.

5. In preparing requests for research grants and contracts, applicants should include direct and indirect costs. When practicable the following manual may be used as a guide: "Explanation of Principles for Determination Costs Under Government Research and Development Contracts with Educational Institutions War Department–Navy Department, August 1947."

6. The Deans of the individual schools may be authorized to depart from any or all of the "Stipulations for Commercial Contracts" in exceptional cases, upon the prior approval of the University contracting officer.

D. Stipulations for Commercial Contracts

1. The study will be directed solely by the principal investigator with the concurrence of the Faculty Committee on Research. However, the officers and employers of the grantor will be welcome to discuss the problems and offer suggestions.

2. The University will permit preliminary negotiations for grants but before any formal contract is consummated it must pass through the appropriate channels of the University.

3. The University Department will agree to use its best judgment in directing the study along the lines of the initial plans to utilize the funds as advantageously as practicable. No agreement or promise is made regarding the results to be obtained and the publication of the findings will be entirely at the discretion of the prinicpal investigator directing the work and the Executive Faculty or the Dean.

4. Original records will be kept by the principal investigator. Reports of progress will be made, through the Dean, to the grantor from time to time as agreed upon. No parts of such reports may be made public until after publication of the results by the investigators except when the investigators specifically release all or part of their report for publication by the grantor.

5. Neither the name of the school nor the name or names of the investigators may be used in advertising or publicity material without authorization by the Executive Faculty or the dean of the school.

6. The University Department, in the absence of a specific agreement to the contrary, shall have the right to publish significant findings resulting from all or any part of the project at the discretion of the principal investigator with approval of the Dean or the Executive Faculty. However, even in the absence of such a specific agreement, careful consideration will be given the opinion of the grantor regarding the opportune time for publication of results.

7. Articles published which are reports of studies under a grant will carry a statement giving credit to the grantor for support of the work.

8. No commercial brands or trade names shall appear in the publication of the results except as such brands or trade names are essential in the description of the research.

9. Reprints of papers written by workers on a project are not to be distributed by the grantor except with the permission of the principal investigator.

10. Nothing in the foregoing Stipulations shall be construed as limiting or proscribing individual initiative in the various fields of research.

Appendix 2

Information Policy
Dahlgren Memorial Library

Access

A. Current access to the Library Information System (LIS) is limited to three components, namely, the Dahlgren Online Catalog (DOC), the mini-MEDLINE SYSTEM (TM), and Interlibrary Loan. Access to the remaining components of LIS is restricted to Library staff. Future database development will be reviewed for access priorities and restrictions.

B. All users of the public access functions are permitted to read data only. The authority to add, change or delete data is restricted to Library staff.

C. Onsite access to DOC is available to all library users for books, audiovisuals programs and journal holdings. Access to the miniMEDLINE SYSTEM and Interlibrary Loan (borrowing) is restricted to registered Library borrowers.

D. Remote terminals at selected sites throughout the Medical Center provide access to DOC, miniMEDLINE and Interlibrary Loan (borrowing). The number of remote sites is determined by port capacity.

E. Dial-up access for Georgetown University Medical Center faculty, students and staff is available for DOC, miniMEDLINE and Interlibrary Loan (borrowing), as port capacity permits, on a first come, first served basis.

F. Dial-up access for non-Georgetown University Medical Center users is provided by subscription for DOC and Interlibrary Loan (lending), as port capacity permits. Access to the miniMEDLINE SYSTEM is available for an additional subscription fee.

G. Hardware will be provided, such as port switchers, to allow the maximum number of remote sites and dial-up access.

H. Access to external systems such as MEDLARS, OCLC, and databases from commercial vendors is handled by the Library staff on behalf of users.

Confidentiality

A. The bibliographic data in the LIS is public domain. Users are permitted to extract records from those files to which they have access and "download" or "upload" into their own personal or departmental computers.

B. Circulation records, budget data and personnel files are restricted.

Ownership

A. Data within the files and all LIS software is owned by the Georgetown University Medical Center.

B. Employees involved in software programming and database development are required to sign a waiver acknowledging ownership rights by the University.

C. Copyrights, trade- or service marks are used for the contents of all databases, software packages and hardware modifications developed by the Library staff to assure legal protection and ownership rights of Georgetown property.

Quality Control

A. Procedure policies are used for the collection of data to ensure accuracy and currency of records. Ongoing review of data collection forms assures uniformity of data entry into the automated systems.

B. Procedures are established for file maintenance of stored bibliograhic and patron records to assure currency and accuracy.

C. Written procedures and staff training provide continuity during staff turnover.

Security

A. Data security is achieved by access priorities through user ID codes, passwords, and restricted terminals.

B. Only Library staff are authorized to add, change or delete data. Authorization is determined by the particular staff function.

C. The main computer hardware and memory is physically protected in a secured, environmentally controlled area. Access is limited to selected Library staff.

D. Appropriate backup systems are available in case of hardware malfunction and include microcomputer-based programs and microfilm and print files.

E. Crucial files are placed on one disk drive and a daily backup copy is made. A second disk drive containing less crucial files is copied two times per week.

F. The physical integrity of the entire database is checked weekly. The operating system logs changes to the files and produces an audit trail.

G. Archival tapes and disk packs of all crucial files are stored off-site.

H. Software is protected from theft and misuse by a variety of measures: externally through employee waiver, copyrights and trade marks; and internally through the choice of programming language and operating system (MUMPS) which provides inherent security.

Standardization

A. Standardized design is used to ensure user friendliness and easy access.

B. Standardization of bibliographic data is controlled at its source, e.g. OCLC, MEDLARS). Standardization of other data is ensured through the use of forms for data entry.

C. Detailed documentation of all LIS components is available.

Fees and Charges

A. Use of DOC is free to all Library users.

B. Use of the miniMEDLINE SYSTEM is available free to registered borrowers of the Dahlgren Library.

C. Non-Georgetown users may have access to DOC by subscription.

D. Off-site access to DOC and miniMEDLINE through dial-up is free to GUMC faculty, students, and staff.

E. Personal file storage in and access to the Library's computer for GUMC faculty, students and staff are prorated.

F. Cost sharing is provided for commercially available "user-friendly" systems, such as the AMA/GTE network, etc.

G. Prorated charges similar to the MEDLINE services are charged for SCI-MATE, BRS-Colleague, etc.

Appendix 3

Georgetown University Medical Center Issues Considered for an Institutional Information Policy

Access

Chief among the purposes of an Integrated Academic Information Management System (IAIMS) are the reduction of redundant records and the promotion of data availability. Georgetown University Medical Center (GUMC) faculty, staff, and students should have access to all appropriate information sources and services available on campus. In an integrated system, access to information and data can be achieved in three ways, as follows:

1. **Data Sources and Access Points:** Sources of data and access points within the GUMC need to be inventoried. A directory of online databases which outlines the contents of the integrated system must be compiled. Each database should contain the title of the file listed, type of software used, and the name of the project utilizing the file. The size, scope, coverage, format, currency, and availability of each file should also be included. In addition, the location of each file must be clearly indicated. In a distributed network of data and knowledge databases, every file may not be available through a centralized system; however, each access point should be noted. The directory of databases will ensure that users are fully aware of the availability of data within the IAIMS. A well-established mechanism for updating the directory will maintain its continued relevance to users. Policies should be written which place responsibility for the continued availability of information for all authorized users even when the database developers may no longer have a need for the information.

2. **Access Priorities:** Levels of priorities of access will need to be established for users of the IAIMS. While all GUMC faculty, staff and students should be aware of the information sources available through the IAIMS, they should not necessarily all have access to every file. Some individuals will only be authorized to read data. In some instances, they will only have access to specific files or to specific records within a file, or to specific fields within records. Other individuals will be authorized to write or change data as well as read it. Still other individuals will be permitted to delete data in addition to writing, changing, and reading data. Each successive level of access requires greater responsibility on the part of the users of the IAIMS. The need to secure data and maintain confidentiality requires that levels of access to data contained in the IAIMS will need to be monitored carefully.

Even users with very limited levels of access have certain rights within the framework of IAIMS. Each user of the System has the right to know what data is currently available, where it is available, and which categories of users may access it in its entirety, in its aggregate form, or not at all. In addition, each user should be aware of his or her own levels of access and of the individual who determines access within his or her department. Security needs should be clearly outlined. Both the data entry and output processes and the decision-making processes of the IAIMS should be as accessible as the content of the database directory.

In addition to priorities of access, protocols for systems access need to be established. During periods of heavy computer use, there may not be enough ports to meet the demands of users with access rights to a particular system and a queue may be formed. Should the queue be based on a first-come-first-served basis or on some other criteria? The type of user requesting access, the expressed needs of that user, and the location of the user's terminal could all be factors in determining his/her place in a queue. Generally, direct patient care providers should take precedence over administrative and research personnel in a computer queue. Those individuals placed at the end of a queue should be told both why they have been denied immediate access to a system and when they may expect to obtain access.

3. **Hardware and Software Choices:** Once the availability of data has been documented and user priorities have been established, access will depend on a variety of equipment factors. Choices of hardware and software need to be fully studied as the third and final step in achieving access. Certain packages automatically control system access. Moreover, an integrated system requires both compatible operating systems and networking capabilities. Provisions for local area networks, modems, dial access, and future expansion need to be examined prior to new equipment purchases. A similar

inventory of current equipment and its capabilities will be made and evaluated. A distributed network of data and knowledge bases is essential for improved access to data but should not require a complete overhaul of present equipment for networking purposes.

Confidentiality

The issue of confidentiality in an Integrated Academic Information Management System (IAIMS) is complex. Whether the actual System takes a centralized or distributed form, data spanning the entire Georgetown University Medical Center (GUMC) will be contained therein. In addition to addressing the confidentiality of patient and medical records, an IAIMS Information Policy must ensure the confidentiality of experimental, budgetary, and management data. Sharing of data should be encouraged, but not all of the information encompassed in an IAIMS should be freely available to all of the System's users. To a large extent, the success of the IAIMS rests on the cooperation of faculty, staff, and students of the GUMC. Their cooperation will be more easily obtained if the issue of the confidentiality of their data or their patient's data is addressed from the beginning of the System's design.

1. **Authorized Access:** To avoid the unauthorized use of data, several steps must be taken to protect confidentiality. Clear guidelines need to be drawn for: (a) the classification of data as confidential; (b) provision for the development of some private files, accessible only to given individuals or departments; and (c) authorization tables restricting access to data. Measures should include the extensive use of passwords and the periodic updating of authorization tables. The number of individuals who may alter or input sensitive data must be strictly limited. Moreover, the ability to restrict data access to specific files, records within files, or fields within records must be incorporated into an IAIMS. Researchers compiling data on the incidence of a particular disease may need to review the Hospital's medical records but they do not need to obtain the names, addresses, and telephone numbers of individual patients. (One exception could be a patient's zip code to permit demographic analyses.)

2. **Right to Privacy:** Access to data within a System should always be limited to a user's specific needs; however, the needs of the System's users are not the sole basis for ensuring confidentiality. The individual's right to privacy is an equally important component of confidentiality. The developers of files must be able to exercise some degree of control over their own databases. This fact is particularly true in experimental data resulting from both basic and clinical research. Access to such information needs to be directly controlled by researchers until all research is completed and published. Similarly, individuals about whom data is gathered for Medical Center files are entitled to the assurance that this information will be used only for the purposes stated. Personal data should not be released for reasons other than those originally stated without the permission of the individuals concerned. Additionally, the right to correct errors in records containing personal data is implicitly recognized. These principles apply to budgetary and management data as well as medical records. Personnel data, grades, and examinations are all affected by the issue of confidentiality.

3. **Medical and Patient Records:** Some special concerns arise relating to confidentiality of patient and medical records. First, the same safeguards must be applied to data in electronic formats as have been applied to hard copy. Patient consent forms and similar items need to be incorporated into computerized records. Secondly, confidentiality of data must be maintained under a wide variety of circumstances not directly controlled by Georgetown University Medical Center. Billing, insurance, and disease data are all transferred electronically to third party payers and other external agencies. Computer Output Microfische (COM), transcription tapes, and print records can each be produced offsite. Strict guidelines regarding the release and use of patient information outside of the GUMC need to be formulated to ensure confidentiality under these circumstances.

4. **Integration of databases:** Clearly, an information policy can be established to protect the confidentiality of patient, experimental, budgetary, and management records. Some additional guidelines, however, need to be drawn to ensure that the IAIMS in its entirety is not abused. Integrated computer systems lend themselves both to the elimination of duplicate records and to the consolidation of information. Some data may need to be maintained in separate, rather than consolidated, records despite the duplication involved to ensure privacy and confidentiality. For instance, the medical record of a GUMC employee who enters Georgetown University Hospital should not be incorporated into his/her personnel record. Such concerns must be addressed directly in the IAIMS Information Policy. Confidentiality cannot be maintained if data is indiscrimi-

nately amalgamated. Perhaps each user of IAIMS should be asked to sign a statement acknowledging the confidentiality of the data contained therein and the gravity of a breach of confidence.

Ownership

Under the Integrated Academic Information Management System (IAIMS) each unit of the Medical Center will have operational data systems. These systems will be networked to encourage the free flow of information and minimize duplication of files. To provide every user of the IAIMS with equal access to the knowledge bases available throughout the System and in order to integrate new data elements effectively into the System, the Chancellor of the Medical Center will assume overall responsibility for the IAIMS. Data contained in the IAIMS will be owned by, or be free to be used by the Medical Center. It will not be owned by individual departments. Employees may be asked to sign statements acknowledging Georgetown University Medical Center's ownership of the data. Copyrights, trade-, or service-marks should be used to provide legal protection for the contents of all databases, software packages, and hardware modifications developed at Georgetown.

Legal protection and ownership rights should be a concern from the start of any project. Careful documentation of system design and software packages will further enhance the IAIMS' viability. Such documentation will be the property of the GUMC and will guarantee the smooth flow of operations in spite of any employee turnover. Employee's rights to programs that they have developed under the auspices of the University for the primary use of GUMC faculty and staff, or to any profits ensuing from such programs, will be strictly limited and defined. Employees involved directly in software and database development will be asked to sign additional statements acknowledging the specific ownership rights of the University in this area.

Quality Control

Quality in relation to any item may be defined as adherence to appropriately defined standards. By definition then, the issues of quality control and standardization are difficult to separate. In an integrated system such as IAIMS, a variety of sources may generate information to be included in a common pool. Potential users may then draw selected items from the pool, recombine them and add additional information to assist in solving problems. Each unit may add to and draw from the common pool. A distinct advantage of an integrated system like IAIMS is that elements of data can be reorganized into new combinations for various purposes. The uses of the common data may be quite different from the activities which produced them.

1. **Data Collection:** The collection of data will be done by every unit, division and department. One of the goals of IAIMS is to transform the huge volumes of raw data into useable information. To be useable, quality data in either patient care, education, research, or management databases must be accessible, accurate, appropriate and timely. The quality of the data must be assured from the very inception of the system. Errors may occur at many points: in charting, in abstracting or coding, during transmission, or in data conversion to machine-readable form. There may be errors such as omission, substitution or transposition of data. To assure quality input into the system, there should be written policies for collection, storage, and dissemination of information. The importance of every bit of data in relation to the entire system must be stressed. It should also be stressed that internal quality control is not punitive or regulatory but rather an integral part of procedures. To enforce the procedures for quality control, there should be ongoing educational programs for all staff and personnel.

2. **Data Storage and Dissemination:** Data must be monitored for quality not only during input but also during storage. Frequently data is not screened or removed at any point; it may be retained for years without review for relevance or priority. Data can change its status as it gets older and requires policies to address the long-term retention and release of data. Written policies are also necessary to address the issues of correct identification of existing and stored data, retention and release of data. If these procedures are followed, the entire system maintains its integrity and quality from the time of input through its entire life.

Security

Much of the data contained in the Integrated Academic Information Management System (IAIMS) will be of a confidential or private nature. Potential users of the System will not be willing to release data to the System unless they are assured that the data will be secure from unauthorized access or other misuse. The development of a sound security system is essentially a two-step process. Users of both operational and planned data systems must first determine exactly what needs to be secured. They then must decide upon the best means of achieving needed security.

Areas to be Secured: In most computer systems, five items are reviewed for securing and include data, memory, terminals, hardware, and software.

1. **Data:** Data already entered into automated files generally requires protection from unintended deletions or alterations and unauthorized persons should be prevented from accessing existing data. New data about to be entered into an existing file requires screening to maintain the quality and accuracy of that file; unauthorized additions to files must be avoided. Data in transmission poses two problems. First, the receipt of correct, unaltered data must be ensured. Second, "electronic eavesdroppers" must be prevented from accessing important data. Finally, data output from files must be secured from unauthorized use and theft. Such output can take a variety of forms including hard copy, computer output microfiche (COM), videodisplay, mountable disks, and magnetic tapes. Whatever the format, it should be assumed that data output from files is as valuable as data in files. Appropriate security measures must not be overlooked. Diskettes pose a special problem since they are portable, widely-used, and of little value in themselves; however, they often contain valuable information.

2. **Memory:** Security measures for both magnetic core storage and mounted magnetic disks, tapes, and drums must be examined. Simultaneous, multiple users of a system's memory should generally be allowed; however, individual privacy must be maintained. Neither unauthorized access to nor erasure of data in use is permissible.

3. **Terminals:** Terminal access presents several tricky problems for security. It is nearly impossible to control the use of data obtained through off-site access. The utilization of hard-wired, leased, and dial-up lines presents additional opportunities for electronic eavedroppers. Generally, the abuse of passwords and access codes is more prevalent away from the security-conscious main site. If off-site terminal access is considered as an IAIMS option, critical decisions will have to be made regarding the remote release of sensitive data and the strictly controlled use of terminal and user identifiers.

4. **Hardware:** The security problems posed by the hardware are generally straight-forward. All computer equipment on the campus of the Georgetown University Medical Center must be physically protected from such problems as fire, theft, flood, sabotage, electrical problems, and air-conditioning failures. Moreover, clear policies regarding vendor support and back-up systems in the event of such emergencies must be obtained.

5. **Software:** Any software developed in-house must be protected from theft or misuse from the earliest development stages. Trade- and servicemarks provide some degree of protection as do statements signed by employees acknowledging University ownership of software packages and databases created internally. The choice of nontransparent operating systems should further protect internal software and files from unauthorized external abuse.

Security Precautions: Once appropriate areas for security have been identified and potential security problems reviewed, specific security precautions and measures must be implemented. Three factors affect the final development of a sound security system.

1. **Access Priorities:** First of all, levels or priorities of access must be established. Authorization tables outlining who may access which files, records, and fields must be developed. Individuals responsible for assigning access priorities must also be identified and apppropriate password programs created or selected. In conjunction with these activities, methods for documenting audit trails, unsuccessful attempts at entry, and overall usage patterns should be adopted.

2. **Disaster Plans:** Secondly, a back-up computer system and disaster plan must be available. Such plans are crucial to the hospital whose computerized life-support systems cannot be shut down. Additionally, the loss of valuable data can be averted if employees are instructed in the handling of disks and tapes during flood, fire or other emergencies.

3. **System Priorities:** Finally, priorities for system security must be developed. Because the cost or difficulty of replacing data files and software programs is higher in certain areas than others, some files and programs will require tighter security. Moreover, security priorities vary from department to department. For instance, the Dahlgren Memorial Library places a greater value on the search software developed in-house for the miniMEDLINE SYSTEM (TM) than it does on the data actually contained in the file and obtained externally. In this instance, software would receive a greater priority with regard to security. On the other hand, departments engaged in experimental cancer protocols assign a higher priority to data compiled in-house than they do to software packages developed externally. Thus, it is

a good rule of thumb to scale both the cost and level of security assigned to a computer system and its components to the value assigned to their loss and replacement.

Standardization

A computer system should be planned around standards early in its development to eliminate barriers to users, provide ease of access to multiple heterogeneous files, and offer increased flexibility for system enhancements and modifications. Standardization may be voluntary or mandatory but it is suggested that in a small system the best way to maintain quality is to adhere to mandatory standards. In a system such as an IAIMS, internal and external standardization must be addressed to maintain quality in each of the System's smallest components as well as to ensure easy interface among all components.

Standards governing a department's internal operations should cover areas such as programming languages, forms for coding, label and file structure, languages for processing of text, and hardware types and protocols for local area networks which may be developed. Careful documentation is important so that policies for standardization may be easily read and followed.

External standards are also necessary to achieve the goal of an integrated system such as IAIMS, in which heterogeneous pieces of equipment are interconnected. In this case, network standards should address all of the following: communications hardware, input/output interfaces, recording media, programming languages, and documentation. Information in a computer system is only useful if it can be moved from where it is stored to where it is needed. This requires development of transmission standards and conventions which must address what items of information should be included, what structure will be used to record data, how items should be encoded or formatted, and what transmission media will be chosen.

Standards to govern internal and external operations may be developed internally or they may be culled from standards which have already been developed outside the system. Internally, standards may be developed by a committee process and then opened for public review. Externally, there are organizations such as the American National Standards Institute (ANSI) which is a national clearinghouse and coordinating agency for voluntary standards in the United States. Since its inception, ANSI has published over 2,800 American National Standards. About 35 of these are directly related to the computer and information processing field.

In attempting to plan for standardization, it is important to remember the importance of early planning and subsequent documentation. Adherence to standards will then assure quality.

Appendix 4

Discussion Guide for the Information Team

In planning for an IAIMS, it will be important to project what the information environment will be in the United States over the next 5 to 10 years, in terms of:

- Information flow
- Types of information networks
- Database development
- Ethical and policy issues

It will be useful to consider the following aspects:

- State-of-the-art in database development (online systems, electronic publishing, etc.)
- Extent of automated information resources in the health care field (patient care, research, education)
- Where GUMC might be in 5 and 10 years, based on optimistic, pessimistic, and moderate forecasts.

Assignment

Prepare written reports for the next Information Team meeting on the following:

1. Policy and ethical issues
   a. Confidentiality
   b. Security
   c. Access
   d. Ownership
   e. Standardization
   f. Quality control
   g. Fees and charges
2. Information policies at other institutions, including academic, industrial, and government.

Appendix 5

Survey of Automated Systems
Georgetown University Medical Center

NAME ______________________________ TITLE ______________

DEPT. ______________________________ DIV. ______________

DUE DATE: Nov. 7, 1983 *

		W.P.(1)	MICRO(2)	MINI(3)	MAINFRAME(4)
1. Does your department have/use (WORD PROCESSORS—W.P., MICRO & MINI COMPUTERS & MAIN FRAME Systems)?	yes/no				
	on order				
	future plans				
2. Type of Hardware:	Manufacturer				
	Model/Year Bought				
	Quantity				
3. Hardware Specifications:	Memory **				
	Disk storage size **				
4. Software Packages:	VISICALC				
	LOTUS 123				
	WORDSTAR				
	OTHERS ______				
5. Primary System Function(s):	Reports				
	Letters & Memos				
	Information storage				
	Billing				
	Other				
6. Level of Staff Operating the System:	Managerial				
	Secretarial				
	Programmers				
	Others				

		YES/NO	APPLICATIONS
7. Does your dept. have access to?:	Central computer facility		
	Dahlgren Library system		
	National Biomedical Research Foundation		
	Commercial Time-Sharing system		
	Georgetown University Medical system		
	Other		

***Please Hand Deliver To: Charles M. O'Brien, Hospital Administrator, 1 Hospital**
****Please skip section 3 if information inadequate**

(1): Stand-Alone; Terminal
(2): IBH-PC, TKS-80 etc.
(3): VAX, PDP etc.
(4): IBM 360,370 etc.

Appendix 6

Interviewer: ____________________ Date of Interview: ____________________

Interview Guidelines
Georgetown University Medical Center

Department/Division: ____________________ Bldg/Room: ____________

Respondent: ____________________ Phone: ____________

1. Does your department/division have word processors?

   Yes ______ No ______ On order ______ Future plans ______

   If no, skip to Question 4.

2. If yes, please list below:

	Manuf	Model	# CPUs	Disk size 5¼	Disk size 8	Mag Card	Purchase Price	Lease Fees	Maintenance Fees
a.									
b.									
c.									

3. If purchase/lease of word processors is planned in the future, please list type and # of CPUs to be ordered:

   ____

   ____

4. Does your department/division have microcomputers?

   Yes ______ No ______ On order ______ Future plans ______

   If no, skip to Question 8.

5. If yes, please list below:

	1	2	3
Manufacturer			
Model			
Quantity			
Operating system			
Programming languages			
Applications software			
Utility software			
Memory storage:			
Current capacity			
Maximum capacity			
Disk storage:			
Current capacity			
Maximum capacity			

# Disk drives			
Use of microcomputer			
Purchase price			
Lease fees			
Maintenance fees			
Annual supply costs			

6. Does your microcomputer have communications capability or is it a stand alone?

7. If purchase/lease of microcomputers is planned in the future, please list type and quantity to be ordered:

8. Does your department/division have minicomputers?
Yes ______ No ______ On order ______ Future plans ______

If no, skip to question 13.

9. If yes, list type(s):

	1	2
Manufacturer		
Model		
Quantity		
Operating system		
Programming languages		
Applications software		
Utility software		
Memory storage:		
Current capacity		
Maximum capacity		
Disk storage:		
Current capacity		
Maximum capacity		
# Disk drives		
Use of minicomputer		
Purchase price		
Lease fees		
Maintenance fees		
Annual supply costs		

(If your department/division has more than two different minicomputers, please list on additional sheets.)

10. If purchase/lease of a minicomputer is planned in the future, please list type and quantity to be ordered:

11. Does your department/division use minicomputers on a time-sharing basis?

Yes ______ No ______ Future plans ______

12. If yes:
Current uses: ______

Projected capabilities: ______

13. Does your department/division have mainframe computers?

Yes ______ No ______ On order ______ Future plans ______

If no, skip to question 16.

14. If yes, please list:

	1	2
Manufacturer		
Model		
Quantity		
Operating system		
Programming languages		
Applications software		
Utility software		
Memory storage:		
Current capacity		
Maximum capacity		
Disk storage		
Current capacity		
Maximum capacity		
# Disk drives		
# Tape drives		
Use of mainframe		
Purchase price		
Lease fees		
Maintenance fees		
Annual supply costs		

(If your department/division has more than two different mainframe computers, please list on additional sheets.)

15. If purchase/lease of a mainframe computer is planned in the future, please list type to be ordered:

______

16. Does your department/division use mainframe computers on a time-sharing basis?

Yes ______ No ______ Future plans ______

17. If yes:

Current uses: ______

Projected capabilities: ______

Peripheral Equipment: Questions 18 through 30 are designed to identify the quantity and type of related computer support equipment.

18. Does your department/division have either CRT/Video display or hard copy terminals?

Yes ________ No ________ On order ________ Future plans ________

19. If yes, please list:

	1	2	3
Manufacturer			
Model			
Type:			
CRT/Video display			
Hard copy			
Quantity			
Purchase price			
Lease fees			
Maintenance fees			

20. Does your department/division have any printers?

Yes ________ No ________ On order ________ Future plans ________

21. If yes, please list:

	1	2	3
Manufacturer			
Model			
Quantity			
Purchase price			
Lease fees			
Maintenance fees			
Annual supply costs			

22. Does your department/division have any modems?

Yes ________ No ________ On order ________ Future plans ________

23. If yes, please list:

	1	2	3
Manufacturer			
Model			
Quantity			
Baud rate			
Purchase price			
Lease fees			
Maintenance fees			

24. Does your department/division have any video monitors?

Yes ________ No ________ On order ________ Future plans ________

25. If yes, please list:

	1	2	3
Manufacturer			
Model			
Quantity			
Purchase price			
Lease fees			
Maintenance fees			

26. Does your department/division have any barcode readers?

Yes ______ No ______ On order ______ Future plans ______

27. If yes, please list:

	1	2	3
Manufacturer			
Model			
Quantity			
Purchase price			
Lease fees			
Maintenance fees			

28. Does your department/division have any other peripheral equipment?

Yes ______ No ______ On order ______ Future plans ______

29. If yes please specify: ______

30. If your department/division has plans to purchase/lease peripheral equipment in the future, please list type and quantity to be ordered:

31. Does your department/division maintain any of the following data in an automated file? (Check as many as applicable)

A. **Patient Care**
   1. Lab results: ______
   2. Pharmacy: ______
   3. Radiology: ______
   4. Patient demographics: ______
   5. Treatment protocols: ______
   6. Patient histories: ______
   7. Vital sign tracking: ______
   8. Diagnostic outcomes: ______
   9. Tumor registry: ______
   10. Operating room: ______
   11. Emergency room: ______
   12. Other, please specify:

B. **Research, basic and clinical**
   1. Protocols: ______
   2. Experiment data: ______
   3. Clinical trials: ______
   4. Data analysis: ______
   5. Other, please specify:

C. **Bibliographic Databases**
   1. Personal: ______
   2. Departmental: ______
   3. Catalog: ______
   4. Serials: ______
   5. Circulation: ______
   6. Acquisitions: ______
   7. Interlibrary loan: ______
   8. Specialized databases: ______

D. **Education**
   1. CAI Programs: ______
   2. Syllabi: ______

3. Student notes: ____________
4. Personal information systems: ____________
5. Knowledge databases: ____________
6. Clinical databases: ____________
7. Patient education: ____________
8. Inservice training: ____________
9. Other, please specify: ____________

____

____

____

E. **Administrative and Support Services**

1. Financial/Accounting ____________
2. Patient billing: ____________
3. Personnel: ____________
4. Hospital admissions: ____________
5. In-patient records: ____________
6. Out-patient records: ____________
7. Faculty practice plan: ____________
8. Student admissions: ____________
9. Student records: ____________
10. Sponsored programs: ____________
11. Equipment inventory: ____________
12. Expendable supply inventory: ____________
13. Utilization review: ____________
14. Faculty contracts: ____________
15. Nurse scheduling: ____________
16. Other, please specify: ____________

____

____

____

32. What databases are you planning to mount in the future? Please use the previous checklist (question #31) for database content and write them in priority of order with 1 being the highest priority.

1. ____________
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________
8. ____________
9. ____________
10. ____________

33. What automated databases has your department/division mounted?

Database name ____________

Database content ____________

Designed at GUMC ____________ Commercially acquired ____________

File configuration:

Total number of records ____________ Average record size ____________ (in KBytes)

Record length: variable ____________ fixed ____________

Are data confidential? ____________ Are there access restrictions? ____________

Are data available to other GUMC users? ____________

If so, who ____________

Communication Networking Capabilities

34. Are your department/division word processors or computers currently linked in a communication network to other computer systems?

Yes ____________ No ____________

If no, skip to question 42.

35. If yes, what type of communication network is utilized?

Direct wire ________ Leased line ________ Dial-up ____________

36. Which access system do you use?

Public Telephone ______________________
Telenet ______________________
Tymnet ______________________
Arpanet ______________________
Uninet ______________________
Other, please specify:
____
____

37. How many terminals external to your department do you have connected? ______________________

38. Is there an established security system?

39. What type of security system is used?

40. How many multiplexors or ports are connected to your computer?

41. What do you use the communication network for? ______________________
____

External Computer Services

42. Does your department/division subscribe to an external computer service?

Yes __________ No __________

If no, skip to question 48.

43. If yes, describe the service and purpose: ______________________
____
____
____

44. Please estimate yearly fee for computer service: ______________________

45. What type of computer is it? ______________________

46. Is the service direct online? __________ or a batch system? ______________________

47. If batch, are there plans to transfer to online mode? Yes ________ No ________

Information Policy

48. Does your department/division have an established information policy for computer services?

Yes __________ No __________

If no, skip to question 50.

49. If yes, does it include any of the following?

Fee structure ______________________
Standardization ______________________
Security ______________________
Confidentiality ______________________
Quality control for data
Ownership of software

Personnel

50. What person in your department/division is responsible for system planning and design?

____
Name Phone Bldg/Room

51. What person in your department/division is responsible for system programming and maintenance?

____

Name Phone Bldg/Room

52. What person in your department/division is responsible for system operations?

____

Name Phone Bldg/Room

53. List individuals in your department/division who use
(if too many: number persons, positions, primary purpose, frequency of use)

Word processors: ____

____

____

Microcomputers: ____

____

____

Minicomputers: ____

____

____

Mainframe Computers: ____

____

____

54. List individuals in your department/division who

Access and/or input data: ____

____

____

Program: ____

____

____

55. Which individuals in your department/division have taken the "Introduction to Microcomputers" course offered by the Dahlgren Library?

____

____

____

Information Flow

56. Where do the automated databases you use reside?

Within your department/division ____________
Within GUMC ____________
Within GU ____________
Outside GU ____________

57. Does anyone outside of your department/division have access to automated databases developed by you? (Check as many as applicable.) No ____________

Hospital ____________
Dental School ____________
Medical School ____________
Nursing School ____________
Chancellor's Office ____________
Dahlgren Library ____________
Law Center ____________
Main Campus ____________
Other, non-GU ____________

58. How frequenty are the databases used by other GUMC departments/divisions?

Daily ________ Weekly ________ Monthly ________ Rarely ________ Never ____________

59. Is there on-line access to any of your automated databases?

GUMC ____________ Main campus ____________ Law Center ____________ Non-GU ____________

60. How is on-line access achieved?

Dial-up ____________ Leased line ____________ Direct Wire ____________ Other ____________

Library

61. Does your department/division maintain a library? Yes ____________ No ____________

If yes, please answer the following questions.

62. Are the books and monographs catalogued? Yes ____________ No ____________

63. What is the collection size?

Number of books/monographs: ____________
Number of current journal subscriptions: ____________
Number of bound journal volumes: ____________

64. Is the library staffed? Yes ____________ No ____________

If yes, by whom? ____________

65. Does your library have access to external databases, such as MEDLINE? Yes ____________ No ____________

66. Is your departmental/divisional library automated? Yes ____________ No ____________

67. Does your department/division library access the Dahlgren Library Information System?

Yes ____________ No ____________

64. If your department/division is buying computers how do you get information on what computer to buy?

Information from salesman ____________
Read computer journals ____________
Consult with the Library ____________
Consult with another department or colleague who has/uses computers
Medical Center computer consultant, Dr. Walter Bechtold

65. When the Library establishes its Computer Information Service, would you use it for consultative purposes?

Yes ____________ No ____________

66. If there was a computer consultant in the Library, would your department/division use the service?

Yes ____________ No ____________

67. Questions about IAIMS.

Appendix 7

IAIMS Self-Study Inventory—Unit Record

DEPARTMENT: DAHLGREN MEMORIAL LIBRARY
ENTRY DATE: 05/30/84
REVISION DATE: 05/17/85

BACKGROUND INFORMATION

HEAD/CHIEF: NAOMI BROERING
TELEPHONE#: 625-2195
ADDRESS: GM-7 PRECLINICAL SCIENCE BUILDING
RESPONDENT: BONNIE CANNARD
TELEPHONE#: 625-2316
ADDRESS: GM-7 PRECLINICAL SCIENCE BUILDING

EQUIPMENT

A. WORD PROCESSORS :

(#1)
1. MANUFACTURER: IBM
2. MODEL: MAGCARD II
3. CPU'S: 1
4. DISK SIZE:
5. MAG CARD: Y
6. QUANTITY: 1
7. PURCHASE PRICE:
8. LEASE FEES:
9. MAINTENANCE FEES:
10. FUTURE PURCHASE: N
11. FUTURE LEASE: N

B. MICROCOMPUTERS:

(#3)
1. MANUFACTURER: IBM
2. MODEL: PC
3. QUANTITY: 5
4. OPERATING SYSTEM: CPM-86/PC-DOS
5. PROGRAMMING LANGUAGE: DOS/BASIC
6. APPLICATIONS SOFTWARE:
   SCI-MATE
   KNOWARE
   INTERNIST
   PFS: WRITE
   VISICALC
   LOTUS 1 2 3
   ADVANCED TRAINING FOR LOTUS
   VOLKSWRITER DELUXE
   PFS: FILE
   POWER-BASE
   CPR TRAINING
   COMPUTER SIMULATIONS IN NURSING
   PFS: REPORT
7. UTILITY SOFTWARE:
8. MEMORY/CURRENT: 256K
9. MEMORY/MAXIMUM: 256K
10. DISKS: F
11. DISK CAPACITY/CURRENT:
12. DISK CAPACITY/MAXIMUM:
13. NUMBER OF DISKS DRIVES: 2
14. USES OF MICROCOMPUTER:
15. PURCHASE PRICE: 1983
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: Y
20. FUTURE LEASE: N

(#4)
1. MANUFACTURER: APPLE
2. MODEL: MACINTOSH
3. QUANTITY: 1
4. OPERATING SYSTEM:
5. PROGRAMMING LANGUAGE: BASIC
6. APPLICATIONS SOFTWARE: MACWRITE/MACPAINT/FILE VISI ON/ THINK TANK
7. UTILITY SOFTWARE:
8. MEMORY/CURRENT: 512K
9. MEMORY/MAXIMUM:
10. DISKS: F
11. DISK CAPACITY/CURRENT:
12. DISK CAPACITY/MAXIMUM:
13. NUMBER OF DISKS DRIVES: 1
14. USES OF MICROCOMPUTER:
15. PURCHASE PRICE: 2495
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: Y
20. FUTURE LEASE: N

(#5)
1. MANUFACTURER: APPLE
2. MODEL: II+
3. QUANTITY: 4
4. OPERATING SYSTEM: DOS/PRODOS
5. PROGRAMMING LANGUAGE: MUMPS/BASIC/PILOT
6. APPLICATIONS SOFTWARE: DEVELOPED IN-HOUSE/C
7. UTILITY SOFTWARE: E
8. MEMORY/CURRENT: 48K
9. MEMORY/MAXIMUM: 64K
10. DISKS: F
11. DISK CAPACITY/CURRENT:
12. DISK CAPACITY/MAXIMUM: 250K
13. NUMBER OF DISKS DRIVES: 2
14. USES OF MICROCOMPUTER: BACKUP TO AUTOMATED CIRCULATION SYSTEM
15. PURCHASE PRICE: 1500
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: N
20. FUTURE LEASE: N

(#7)
1. MANUFACTURER: APPLE
2. MODEL: IIe
3. QUANTITY: 1
4. OPERATING SYSTEM: DOS/PRODOS
5. PROGRAMMING LANGUAGE: BASIC
6. APPLICATIONS SOFTWARE:
   VISICALC
   PFS: WRITE
   WORDHANDLER
   APPLE SOFT
   DATA CAPTURE
   MILLIKEN CAI
   TYPING TUTOR
   MECA
7. UTILITY SOFTWARE:
8. MEMORY/CURRENT: 64K
9. MEMORY/MAXIMUM:
10. DISKS: F

11. DISK CAPACITY/CURRENT:
12. DISK CAPACITY/MAXIMUM: 250K
13. NUMBER OF DISKS DRIVES: 2
14. USES OF MICROCOMPUTER:
15. PURCHASE PRICE: 2039
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: N
20. FUTURE LEASE: N

C. MINICOMPUTERS :

(#2)
1. MANUFACTURER: DEC
2. MODEL: PLESSEY 11/34A
3. QUANTITY: 1
4. OPERATING SYSTEM: INTERSYSTEMS M-11
5. PROGRAMMING LANGUAGE: MUMPS
6. APPLICATIONS SOFTWARE:
   LIS/VA FILE MANAGER/QUEST/P HILSOM III
7. UTILITY SOFTWARE:
8. MEMORY/CURRENT: 256K
9. MEMORY/MAXIMUM: 256K
10. DISKS: H
11. DISK CAPACITY/CURRENT: 508M
12. DISK CAPACITY/MAXIMUM:
13. NUMBER OF DISKS DRIVES: 2
14. USES OF MINICOMPUTER: LIBRARY INFORMATION SYSTEM
15. PURCHASE PRICE: 86219
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: N
20. FUTURE LEASE: N
21. TIME-SHARING/CURRENT: N
22. TIME-SHARING/PROJECTED: N

(#3)
1. MANUFACTURER: DEC
2. MODEL: PLESSEY 11/44
3. QUANTITY: 1
4. OPERATING SYSTEM: INTERSYSTEMS M-11
5. PROGRAMMING LANGUAGE: MUMPS
6. APPLICATIONS SOFTWARE:
   LIS/VA FILE MANAGER/QUEST/P HILSOM III
7. UTILITY SOFTWARE:
8. MEMORY/CURRENT: 3M
9. MEMORY/MAXIMUM: 3M
10. DISKS: H
11. DISK CAPACITY/CURRENT: 1G
12. DISK CAPACITY/MAXIMUM: 1.4G
13. NUMBER OF DISKS DRIVES: 3
14. USES OF MINICOMPUTER: LIBRARY INFORMATION SYSTEM
15. PURCHASE PRICE: 51914
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: N
20. FUTURE LEASE: N
21. TIME-SHARING/CURRENT: N
22. TIME-SHARING/PROJECTED: N

D. MAINFRAMES:

(#1)
1. MANUFACTURER:
2. MODEL:
3. QUANTITY:
4. OPERATING SYSTEM:
5. PROGRAMMING LANGUAGE:
6. APPLICATIONS SOFTWARE:
7. UTILITY SOFTWARE:
8. MEMORY/CURRENT:
9. MEMORY/MAXIMUM:
10. DISKS:
11. DISK CAPACITY/CURRENT:
12. DISK CAPACITY/MAXIMUM:
13. NUMBER OF DISKS DRIVES:
14. USES OF MAINFRAME:
15. PURCHASE PRICE:
16. LEASE FEES:
17. MAINTENANCE FEES:
18. ANNUAL SUPPLY COSTS:
19. FUTURE PURCHASE: N
20. FUTURE LEASE: N
21. TIME-SHARING/CURRENT: Y
22. TIME-SHARING/PROJECTED: N
23. NUMBER OF TAPE DRIVES:

E. TERMINALS:

(#1)
1. MANUFACTURER: LEAR SIEGLER
2. MODEL: ADM-5
3. TYPE: CRT
4. QUANTITY: 23
5. PURCHASE PRICE: 550
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#2)
1. MANUFACTURER: LEAR SIEGLER
2. MODEL: ADM-3 +
3. TYPE: CRT
4. QUANTITY: 3
5. PURCHASE PRICE: 550
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#3)
1. MANUFACTURER: LEAR SIEGLER
2. MODEL: ADM-11
3. TYPE: CRT
4. QUANTITY: 16
5. PURCHASE PRICE: 550
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#4)
1. MANUFACTURER: DEC
2. MODEL: DECWRITER LA 120
3. TYPE: HARD
4. QUANTITY: 3
5. PURCHASE PRICE: 2300
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#5)
1. MANUFACTURER: DEC
2. MODEL: 120 CONSOLE
3. TYPE: HARD
4. QUANTITY: 1
5. PURCHASE PRICE: 2300
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#6)
1. MANUFACTURER: TEXAS INSTRUMENTS
2. MODEL: 820 KSR
3. TYPE: HARD
4. QUANTITY: 2
5. PURCHASE PRICE: 2400
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#7)
1. MANUFACTURER: TEXAS INSTRUMENTS
2. MODEL: 743 KSR
3. TYPE: HARD
4. QUANTITY: 1
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#8)
1. MANUFACTURER: COMPUTER DEVICES
2. MODEL: TELETERM 1030
3. TYPE: HARD
4. QUANTITY: 2
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#9)
1. MANUFACTURER: DEC
2. MODEL: VT 100
3. TYPE: CRT
4. QUANTITY: 1
5. PURCHASE PRICE: 1800
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#10)
1. MANUFACTURER: DEC
2. MODEL: VT 102
3. TYPE: CRT
4. QUANTITY: 1
5. PURCHASE PRICE: 1400
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#11)
1. MANUFACTURER: HAZELTINE
2. MODEL: 2000
3. TYPE: CRT
4. QUANTITY: 1
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#12)
1. MANUFACTURER: DATA MEDIA
2. MODEL: EXCEL 44
3. TYPE: CRT
4. QUANTITY: 3
5. PURCHASE PRICE: DONATED
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#13)
1. MANUFACTURER: MICRO TERM INC.
2. MODEL: ACT-V
3. TYPE: CRT
4. QUANTITY: 1
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#14)
1. MANUFACTURER: DEC
2. MODEL: VT 220
3. TYPE: CRT
4. QUANTITY: 1
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#15)
1. MANUFACTURER: BEEHIVE
2. MODEL: OCLC 100
3. TYPE:
4. QUANTITY: 1
5. PURCHASE PRICE: 1000
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE:
9. FUTURE LEASE:

F. PRINTERS:

(#1)
1. MANUFACTURER: OKIDATA
2. MODEL: MICROLINE
3. QUANTITY: 13
4. PURCHASE PRICE: 705
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#2)
1. MANUFACTURER: DEC
2. MODEL: 100 LETTER
3. QUANTITY: 1
4. PURCHASE PRICE: 2400
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#3)
1. MANUFACTURER: AXIOM
2. MODEL: 801
3. QUANTITY: 2
4. PURCHASE PRICE: 900
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#4)
1. MANUFACTURER: XEROX
2. MODEL: DIABLO
3. QUANTITY: 2

4. PURCHASE PRICE: 1869
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#5)
1. MANUFACTURER: DATA PRODUCTS
2. MODEL:
3. QUANTITY: 1
4. PURCHASE PRICE:
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#6)
1. MANUFACTURER: GENERAL ELECTRIC
2. MODEL: TERMINET 200
3. QUANTITY: 1
4. PURCHASE PRICE:
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#7)
1. MANUFACTURER: EPSON
2. MODEL: MX 100 III
3. QUANTITY: 2
4. PURCHASE PRICE:
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#8)
1. MANUFACTURER: OKIDATA
2. MODEL: MICROLINE 92
3. QUANTITY: 3
4. PURCHASE PRICE: 465
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: Y
8. FUTURE LEASE: N

(#9)
1. MANUFACTURER: APPLE
2. MODEL: IMAGEWRITER
3. QUANTITY: 1
4. PURCHASE PRICE: 495
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: Y
8. FUTURE LEASE: N

(#10)
1. MANUFACTURER: HAZELTINE
2. MODEL:
3. QUANTITY:
4. PURCHASE PRICE:
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE:
8. FUTURE LEASE:

G. MODEMS:

(#1)
1. MANUFACTURER: RACAL/VADIC
2. MODEL: 3467
3. QUANTITY: 1
4. BAUD RATE: 1200
5. PURCHASE PRICE: 750
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#2)
1. MANUFACTURER: RACAL/VADIC
2. MODEL: 3447
3. QUANTITY: 1
4. BAUD RATE: 1200
5. PURCHASE PRICE: 500
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#3)
1. MANUFACTURER: RACAL/VADIC
2. MODEL: 3434
3. QUANTITY: 2
4. BAUD RATE: 300
5. PURCHASE PRICE: 200
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#4)
1. MANUFACTURER: PARADYNE
2. MODEL: LSI 24
3. QUANTITY: 1
4. BAUD RATE: 300
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#5)
1. MANUFACTURER: RACAL/VADIC
2. MODEL: 3413
3. QUANTITY: 2
4. BAUD RATE: 1200
5. PURCHASE PRICE: 550
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#6)
1. MANUFACTURER: HAYES
2. MODEL: SMARTMODEM
3. QUANTITY: 4
4. BAUD RATE: 1200
5. PURCHASE PRICE: 550
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#7)
1. MANUFACTURER: PENRIL
2. MODEL: PSH 96
3. QUANTITY: 4
4. BAUD RATE: 300-9600
5. PURCHASE PRICE: 250
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: N
9. FUTURE LEASE: N

(#8)
1. MANUFACTURER: HAYES
2. MODEL: SMARTMODEM INTERNAL
3. QUANTITY: 3
4. BAUD RATE: 1200
5. PURCHASE PRICE: 499
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE: Y
9. FUTURE LEASE: N

(#9)
1. MANUFACTURER: VADIC
2. MODEL: 3451
3. QUANTITY:
4. BAUD RATE:
5. PURCHASE PRICE: 725
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE:
9. FUTURE LEASE:

(#11)
1. MANUFACTURER: ANDERSON JACOBSON
2. MODEL: A242
3. QUANTITY: 1
4. BAUD RATE:
5. PURCHASE PRICE:
6. LEASE FEES:
7. MAINTENANCE FEES:
8. FUTURE PURCHASE:
9. FUTURE LEASE:

H. VIDEO MONITORS:

(#2)
1. MANUFACTURER: SANYO
2. MODEL: DM 5012CX
3. QUANTITY: 2
4. PURCHASE PRICE:
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#3)
1. MANUFACTURER: NEC
2. MODEL: CHARACTER DISPLAY
3. QUANTITY: 2
4. PURCHASE PRICE:
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#4)
1. MANUFACTURER: AMDEK
2. MODEL: AMBER MONOCHROME
3. QUANTITY: 3
4. PURCHASE PRICE: 140
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: Y
8. FUTURE LEASE: N

I. BARCODE READERS:

(#1)
1. MANUFACTURER: INTERMEC
2. MODEL: 9300
3. QUANTITY: 6
4. PURCHASE PRICE: 900
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

(#2)
1. MANUFACTURER: INTERMEC
2. MODEL: 9400
3. QUANTITY: 1
4. PURCHASE PRICE: 2100
5. LEASE FEES:
6. MAINTENANCE FEES:
7. FUTURE PURCHASE: N
8. FUTURE LEASE: N

J. ADDITIONAL PERIPHERAL EQUIPMENT:

(#1)
1. MANUFACTURER: SYMBOL TECHNOLOGIES
2. MODEL: LASERSCAN
3. QUANTITY: 1
4. USE/PURPOSE: LASER SCANNER FOR CIRCULATI ON

FILES

1. PATIENT CARE FILES: N
2. RESEARCH, BASIC AND CLINICAL, FILES: N
3. BIBLIOGRAPHIC DATABASES: Y
    1 PERSONAL, Y
        A) CONFIDENTIAL
        B) RESTRICTED ACCESS, Y
        C) RESTRICTED INPUT, Y
    2 DEPARTMENTAL, Y
        A) CONFIDENTIAL
        B) RESTRICTED ACCESS, Y
        C) RESTRICTED INPUT, Y
    3 CATALOG, Y
        A) CONFIDENTIAL, N
        B) RESTRICTED ACCESS, N
        C) RESTRICTED INPUT, Y
    4 SERIALS, Y
        A) CONFIDENTIAL, N
        B) RESTRICTED ACCESS, N
        C) RESTRICTED INPUT, Y
    5 CIRCULATION, Y
        A) CONFIDENTIAL, Y
        B) RESTRICTED ACCESS, Y
        C) RESTRICTED INPUT, Y
    6 ACQUISITIONS, Y
        A) CONFIDENTIAL, Y
        B) RESTRICTED ACCESS, Y
        C) RESTRICTED INPUT, Y
    7 INTERLIBRARY LOAN, Y
        A) CONFIDENTIAL
        B) RESTRICTED ACCESS
        C) RESTRICTED INPUT
    8 SPECIALIZED DATABASES, Y
        A) CONFIDENTIAL, N
        B) RESTRICTED ACCESS, N
        C) RESTRICTED INPUT, Y
    9 OTHER (PLEASE SPECIFY)

4. EDUCATION FILES: Y
    1 CAI PROGRAMS, Y
        A) CONFIDENTIAL, N
        B) RESTRICTED ACCESS, N
        C) RESTRICTED INPUT, Y
    2 SYLLABI, N
    3 STUDENT NOTES, N
    4 PERSONAL INFORMATION SYSTEMS, Y
        A) CONFIDENTIAL
        B) RESTRICTED ACCESS
        C) RESTRICTED INPUT

5 KNOWLEDGE DATABASES, Y
  A) CONFIDENTIAL
  B) RESTRICTED ACCESS
  C) RESTRICTED INPUT
6 CLINICAL DATABASES, Y
  A) CONFIDENTIAL
  B) RESTRICTED ACCESS
  C) RESTRICTED INPUT
7 PATIENT EDUCATION, N
8 INSERVICE TRAINING, N
9 OTHER (PLEASE SPECIFY), N

5. ADMINISTRATIVE AND SUPPORT FILES: Y
1 FINANCIAL/ACCOUNTING, Y
  A) CONFIDENTIAL, Y
  B) RESTRICTED ACCESS, Y
  C) RESTRICTED INPUT, Y
2 PATIENT BILLING, N
3 PERSONNEL, Y
  A) CONFIDENTIAL, Y
  B) RESTRICTED ACCESS, Y
  C) RESTRICTED INPUT, Y
4 HOSPITAL ADMISSIONS, N
5 IN-PATIENT RECORDS, N
6 OUT-PATIENT RECORDS, N
7 FACULTY PRACTICE PLAN, N
8 STUDENT ADMISSIONS, N
9 STUDENT RECORDS, N
10 SPONSORED PROGRAMS, N
11 EQUIPMENT INVENTORY, Y
  A) CONFIDENTIAL, N
  B) RESTRICTED ACCESS, N
  C) RESTRICTED INPUT, Y
12 EXPENDABLE SUPPLY INVENTORY, N
13 UTILIZATION REVIEW, N
14 FACULTY CONTRACTS, N
15 NURSE SCHEDULING, N
16 OTHER (PLEASE SPECIFY), N

Automated Databases

DATABASE #1

NAME: LIS(LIBRARY INFORMATION SYSTEM)
CONTENT: 8 MODULES FOR COMPUTERIZED LIB. FUNCTIONS
DESIGNED: AT GUMC
NUMBER OF RECORDS:
RECORD SIZE:
RECORD LENGTH: VARIABLE
AVAILABLE TO OTHER GUMC USERS: Y
CONFFIDENTIAL: N
ACCESS RESTRICTIONS: Y
RESIDE:
WITHIN DEPT/DIVISION: Y
WITHIN GUMC: N
WITHIN GU: N
OUTSIDE GU: N

DATABASE #2

NAME: MINIMEDLINE
CONTENT: USER-FRIENDLY BIBLIOGRAPHIC FILE
DESIGNED: AT GUMC
NUMBER OF RECORDS: 165,000
RECORD SIZE:
RECORD LENGTH: VARIABLE
AVAILABLE TO OTHER GUMC USERS: Y
CONFFIDENTIAL: N
ACCESS RESTRICTIONS: Y
RESIDE:
WITHIN DEPT/DIVISION: Y
WITHIN GUMC: N
WITHIN GU: N
OUTSIDE GU: N

DATABASE #3

NAME: DAHLGREN ONLINE CATALOG (DOC)
CONTENT: LIBRARY'S HOLDINGS PRINT/NONPRINT
DESIGNED: AT GUMC
NUMBER OF RECORDS:
RECORD SIZE:
RECORD LENGTH: VARIABLE
AVAILABLE TO OTHER GUMC USERS: Y
CONFFIDENTIAL: N
ACCESS RESTRICTIONS: N
RESIDE:
WITHIN DEPT/DIVISION: Y
WITHIN GUMC: N
WITHIN GU: N
OUTSIDE GU: N

Networking/External Access

CURRENT LINKAGE: Y
PROPOSED LINKAGE: Y
TYPE OF LINE:
DIRECT WIRE: Y
LEASED LINE: Y
DIAL-UP: Y
NETWORK:
TELENET: Y
TYMNET: Y
ARAPANET: N
UNINET: N
DIRECT DIAL: Y
NUMBER OF PORTS: 48
NUMBER OF MULTIPLEXORS:
SECURITY: Y
ACCESS LIS: Y
ACCESS SDC/FACULTY PRACTICE PLAN: N
ACCESS HIS: N
ACCESS CCF/DOWN CAMPUS COMPUTER: Y
SUBSCRIBE TO OUTSIDE INFORMATION SERVICES: Y
1. MEDLARS
2. BRS
3. DIALOG
4. SDC—BIBLIOGRAPHIC FILES
5. AMA-GTE
6. PHILSOM
7. OCLC ACCESS OTHER EXTERNAL SYSTEMS: N

Library

DEPT/DIVISION MAINTAINS LIBRARY: Y

Information Policy

FEE STRUCTURE: Y
STANDARDIZATION: Y
SECURITY: Y
CONFIDENTIALITY: Y
QUALITY CONTROL: Y
OWNERSHIP OF SOFTWARE: Y

Personnel

SYSTEM PLANNING & DESIGN: NAOMI C. BROERING
SYSTEM PROGRAMMING & MAINTENANCE: BONNIE G. CANNARD
SYSTEM OPERATIONS: BONNIE G. CANNARD
INHOUSE PROGRAMMERS:
BONNIE G. CANNARD
LINDA FORESTER
KAREN KERLIN
ROBERT LARSON
BRENDA SEAGO

Appendix 8

Self Study Inventory Database Sample Summary Reports

Equipment Summary Cumulation

Equipment Summary by Departments/Divisions

Equipment Summary within Department/Division:

- Dahlgren Memorial Library

Equipment Summary by Manufacturer/Model:

- Microcomputers
- Minicomputers

Software Summary by Hardware Type:

- Microcomputers
- Minicomputers

Networking Summary Cumulation

Networking Summary by Departments

Equipment Summary Cumulation
9/18/85

Number of Respondent Departments/Divisions 49

Equipment	Total Quantity	Number of Departments
Word Processors	51	19
Microcomputers	163	34
Minicomputers	35	14
Mainframes	1	1
Terminals	634	37
Printers	332	38
Modems	91	27
Video Monitors	42	13
Barcode Readers	29	3
Additional Equipment	53	13
TOTAL	1,431	

Equipment Summary by Departments/Divisions

KEY

1. Word Processors	**3. Minicomputers**	**5. Terminals**	**7. Modems**	**9. Barcode Readers**
2. Microcomputers	**4. Mainframes**	**6. Printers**	**8. Video Monitors**	**10. Additional Equipment**

Department/Division	Equipment 1	2	3	4	5	6	7	8	9	10
Anatomy	2	14	1			15				
Anesthesia		4			3	4	1	1		
Biochemistry		11			1	3	4	12		
Chancellor's Office—Administrative	8	1			1	7	1	3		
Chancellor's Office—Radiation Control			1		5	2	2			
Clinical Laboratories		3			62		2	2		
Clinical Laboratories—Coagulation Laboratory					1					

KEY

1. Word Processors	**3. Minicomputers**	**5. Terminals**	**7. Modems**	**9. Barcode Readers**
2. Microcomputers	**4. Mainframes**	**6. Printers**	**8. Video Monitors**	**10. Additional Equipment**

Department/Division	Equipment 1	2	3	4	5	6	7	8	9	10
Community and Family Medicine	2	14	1		9	11	5			3
Community Dentistry										
Dahlgren Memorial Library	1	11	2		60	26	19	7	7	1
Dental School—Clinic	1	3			18	11			2	
Dental School—Dean's Office	4				15	14	1			
Dental School—Student and Academic Affairs	2				1					
Dental School—Student Services	1				1	1	1			
Educational Media		1				1	1			1
Emergency Medicine		1			4	3				
Emergency Medicine—Poison Center		2			1		1			1
Hospital Information System—Administrative Office		1			54	5	11			
Hospital Information System—Operations			8	1	264	148			20	31
Immunology		1			1		1			
Lombardi Cancer Center	5	10	1		10	5	1			6
Medical School—Admissions and Records					5					
Medical School—Associate Dean, Students		2				1		1		
Medical School—Associate Dean, Undergraduate		2				1				
Medical School—Continuing Medical Education			1		4	1	2			
Medical School—Dean	3	12			1	8	5			1
Medical School—Faculty Practice Plan			2		14	2				1
Medical School—Financial Aid		1			1	1	2			
Medical School—Sponsored Programs	2	2				3				
Medicine—Administrative Office		13				6	1	2		1
Medicine—Ambulatory Medical Services		4			10	4	1	1		
Medicine—Billing and Collection		2			12	1				
Medicine—Cardiology		2	6		9	1	7			1

KEY

1. Word Processors	**3. Minicomputers**	**5. Terminals**	**7. Modems**	**9. Barcode Readers**
2. Microcomputers	**4. Mainframes**	**6. Printers**	**8. Video Monitors**	**10. Additional Equipment**

Department/Division	**Equipment**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Microbiology	1					1				
Neurology	3	2	2		1		1			
Nursing School—Graduate Programs	3	5			1	8				
Obstetrics/Gynecology	1	4	1		11	7	7	4		
Ophthalmology	3				2	1				
Oral Diagnosis										
Pathology	6	1			1	2				
Pediatrics		3			13	3	2	6		
Pharmacology		4	2		16	4	1			
Physical Medicine and Rehabilitation					2	1				
Physiology/Biophysics		8			3	9	2			1
Psychiatry	1	1				1		1		
Radiation Medicine		5	2		3		7	1		4
Radiology		12	5			9	2			1
Surgery	2	1			14	1		1		
Total	51	163	35	1	634	332	91	42	29	53

Equipment Summary Within Department/Division Dahlgren Memorial Library 9/18/85

Word Processors

Manufacturer	Model	Quantity
IBM	MAGCARD II	1
	SUBTOTAL	1

Microcomputers

Manufacturer	Model	Quantity
APPLE	II +	4
	IIe	1
	MACINTOSH	1
	SUBTOTAL	6
IBM	PC	5
	SUBTOTAL	5

Minicomputers

Manufacturer	Model	Quantity
DEC	VAX 785	1
	PLESSEY 11/44	1
	SUBTOTAL	2

Mainframes

Terminals

Manufacturer	Model	Quantity
BEEHIVE	OCLC 100	1
	SUBTOTAL	1
COMPUTER DEVICES	TELETERM 1030	2
	SUBTOTAL	2
DATA MEDIA	EXCEL 44	3
	SUBTOTAL	3
DEC	120 CONSOLE DECWRITER	1
	LA 120	3
	VT 100	1
	VT 102	1
	VT 220	1
	SUBTOTAL	7
HAZELTINE	2000	1
	SUBTOTAL	1
LEAR SIEGLER	ADM-11	16
	ADM-3 +	3
	ADM-5	23
	SUBTOTAL	42
MICRO TERM INC.	ACTV	1
	SUBTOTAL	1
TEXAS INSTRUMENTS	743 KSR	1
	820 KSR	2
	SUBTOTAL	3

Printers

Manufacturer	Model	Quantity
APPLE	IMAGEWRITER	1
	SUBTOTAL	1
AXIOM	801	2
	SUBTOTAL	2
DATA PRODUCTS	?	1
	SUBTOTAL	1
DEC	100 LETTER	1
	SUBTOTAL	1
EPSON	MX 100 III	2
	SUBTOTAL	2
GENERAL ELECTRIC	TERMINET 200	1
	SUBTOTAL	1
OKIDATA	MICROLINE	13
	MICROLINE 92	3
	SUBTOTAL	16
XEROX	DIABLO	2
	SUBTOTAL	2

Modems

Manufacturer	Model	Quantity
ANDERSON JACOBSON	A242	1
	SUBTOTAL	1
HAYES	SMARTMODEM	4
	SMARTMODEM INTERNAL	3
	SUBTOTAL	7

Manufacturer	Model	Quantity
PARADYNE	LSI 24	1
	SUBTOTAL	1
PENRIL	PSH 96	4
	SUBTOTAL	4
RACAL/VADIC	3413	2
	3434	2
	3447	1
	3467	1
	SUBTOTAL	6
Video Monitors		
AMDEK	AMBER MONOCHROME	3
	SUBTOTAL	3
NEC	CHARACTER DISPLAY	2
	SUBTOTAL	2
SANYO	DM 5012CX	2
	SUBTOTAL	2
Barcode Readers		
INTERMEC	9300	6
	9400	1
	SUBTOTAL	7

Equipment Summary by Manufacturer/Model Microcomputers 09/18/85

Manufacturer	Model	Quantity
APPLE	II	2
	II +	14
	IIE	2
	III	3
	IIe	16
	MACINTOSH	2
	SUBTOTAL	39
ATARI	800	1
	SUBTOTAL	1
COMPAQ	?	1
	PORTABLE	2
	SUBTOTAL	3
DEC	RAINBOW 100	4
	SUBTOTAL	4
DIGITAL	MINIMINC	1
	PHOCUS	1
	SUBTOTAL	2
IBM	5120	1
	AT	2
	PC	83
	PCXT	3
	PC8088	3
	XT	10
	SUBTOTAL	102
KAYPRO	?	1
	SUBTOTAL	1
RADIO SHACK	TRS 80	4
	TRS 80 104	1
	TRS 80-1	1
	TRS 80-3	1
	TRS 80.C	1
	TRS-100	1
	TRS-4	1
	SUBTOTAL	10
WANG	PC	1
	SUBTOTAL	1
TOTAL MICROCOMPUTERS		163

Software Summary by Hardware Type Microcomputers 9/18/85

Operating Systems

86	2
	1
0S9	1
CPM	9
CPM 80	2
CPM-86	1
DOS	20

Operating Systems

DOS 2.1	4
DOS 3.3	1
FLEX	1
MOS	1
MS	1
MS DOS	2
NEW DOORS	4
PC-DOS	1
PRODOS	3
RS-DOS	1
SOS	2
TRIS-DOS	1
VM-CMS	3

Programming Languages

ASSEMBLY	1
BASIC	28
BASIC +	2
BASIC, INTEGRATED	1
BASIC, FORTH	1
BASIC, PASCAL	1
BASIC; PASCAL	1
DOS	1
FORTRAN	1
INTEGER	1
MUMPS	2
PASCAL	1
PILOT	3
PL1	3
SAME AS FOR PC'S	2
SUPERPILOT	1

Applications Software

3101 EMULATOR	3
3278 EMULATOR	3
ADVANCED STATISTICAL ANALYSIS	4
ADVANCED TRAINING FOR LOTUS	1
APPLE ACCESS	1
APPLE GRAPHICS	1
APPLE SOFT	3
APPLE WRITER	2
C	2
CHARTMASTER	1
COMPUTER SIMULATIONS IN NURSING	1
CPR TRAINING	1
DATA BASE MANAGER	2
DATA BASE, MASTER	1
DATA CAPTURE	3
DATA MANAGEMENT	4
DATA MANAGER	3
DATABASE MANAGEMENT	1
DB MASTER	2
DBASE II	5
DBASEII	2
DEVELOPED IN-HOUSE	2
EXECUTIVE BRIEFING SYSTEM	1
INTERNIST	1
KNOWARE	1
LOTUS	3
LOTUS 1 2 3	6
LOTUS, D-BASE, WORDPERFECT	1
LOTUS, DISPLAY WRITE II	1
LOTUS, WORD PROC	2
MAGICWAND	5
MAILMERGE	1
MATH COPROCESSOR	1
MECA	3
MILLIKEN CAI	3
MULTIPLAN	1
PFS: FILE	1
PFS: REPORT	1
PFS: WRITE	3
POWERBASE	1
QUICKFILE	1
RBASE 4000	1
RBASE 4000, K-MAN, WORD PERFECT	1
SAME AS FOR PC'S	2
SCI-MATE	1
SCRIPTSIT	5
SPELSOM	2
SPREADSHEET	1
SPREADSHEET, BUSINESS GRAPHICS, WORD PROC., DATA	1
SUPERSCRIPTSIT	4
SYMPHONY	3
TYPING TUTOR	3
VERSIFILE	1
VISICALC	16
VISIPLOT	1
VOLKSWRITER	1
VOLKSWRITER DELUXE	1
WORD	2
WORD PROCESSING	2
WORD PROCESSING FROM WANG	1
WORDHANDLER	3
WORDSTAR	7

Software Summary by Hardware Type Minicomputers
9/18/85

Operating Systems

	3
CPM	1
INTERSYSTEMS M-11	2
M-PLUS,RT-11	1
MDOS	1
MDPS OWNED	1
MUMPS	2
MUMPS MSM-09	1
OS8	2
RSX 11M V3.2	1
RSX 11M V4.1	2
RSX-11,M	1
RSX11M V4.0	2
RT 11 V5.0	2
RT-11	2
VMS	2

Programming Languages

ASSEMBLER	3
BASIC	4
BASIC+2	2
FORTRAN	9
FORTRAN 77	1
MDPS OWNED	1
MUMPS	4
PL1	1
PROPRIETARY—MEDICL,FORTRAN	2
ZEUSS-UNIX	1

Applications Software

AECL=ATOMIC ENERGY OF CANADA LTD.	1
ARRHTHYMIA MONITORING FOR CSCU, HOLTER MONITORING,	2
CT-IMAGE PROCESSING SOFTWARE	3
CTS-HEART,WORD PROCESSING	1
DBASE II	1
IN-HOUSE	1
LIS	2
MDPS OWNED	1
NUC MED-IMAGE PROCESSING SOFTWARE	2
PHILSOM III	2
PROPRIETARY	1
QUEST	2
RADIATION THERAPY TREATMENT PLANNING	2
SUPPLIED BY EXXON	1
TURNKEY ECG CRITERIA RESEARCH PACKAGE	1
VA FILE MANAGER	3
WORD PROCESSING PROGRAM	1

Networking Summary Cumulation
9/18/85

Network	Number of Departments
Internal	
ADIS	1
CCF	17
CONTINUING MED ED COMPUTER	1
DOWNCAMPUS IBM 370	1
HIS	20
LIS	8
PASS	1
External	
AMA-GTE	2
BRS	2
DENTAL MINICOMPUTER	3
DIALOG	1
DONOR ORGAN AVAILABILITY	1
DRUGDEX	1
EMERGINDEX	1
FINANCIAL AID	1
LABORATORY RESULTS	1
MEDLARS	3
NAT CTR MATERNAL CHILD HLTH EDUC	2
NATIONAL NETWORK OF CHILD DEVELOPMENT PROGRAMS	1
NATIONAL POISON EXPOSURE DATABASE	2
NBRF	3
NIH COMPUTER	3
NIH PROPHET SYSTEM	1
OCLC	1
OSI	1
PHILSOM	1
PHYCON BRS COLLEAGUE	1
POISINDEX	1
PREPARATION OF FILM BADGE DATA	1
SDC	15
SDC—BIBLIOGRAPHIC FILES	1
THE SOURCE	2
UNIVERSITY FINANCIAL AID SYSTEM	3

Networking Summary by Departments
9/18/85

Anatomy

NIH PROPHET SYSTEM

Anesthesia

HIS
NIH COMPUTER

Biochemistry

BRS
CCF
LIS
NBRF

Chancellor's Office—Administrative

ADIS
CCF
LIS

Chancellor's Office—Radiation Control

PREPARATION OF FILM BADGE DATA

Clinical Laboratories

CCF
DONOR ORGAN AVAILABILITY
HIS
LABORATORY RESULTS

Clinical Laboratories—Coagulation Laboratory

HIS

Community and Family Medicine

CCF
CONTINUING MED ED COMPUTER
NAT CTR MATERNAL CHILD HLTH EDUC
OSI
PHYCON BRS COLLEAGUE
SDC

Community Dentistry

NONE

Dahlgren Memorial Library

AMA-GTE
BRS
CCF
DIALOG
LIS
MEDLARS
OCLC
PHILSOM
SDC—BIBLIOGRAPHIC FILES

Dental School—Clinic

DENTAL MINICOMPUTER

Dental School—Dean's Office

CCF
DENTAL MINICOMPUTER
UNIVERSITY FINANCIAL AID SYSTEM

Dental School—Student and Academic Affairs

CCF

Dental School—Student Services

CCF
DENTAL MINICOMPUTER
UNIVERSITY FINANCIAL AID SYSTEM

Educational Media

THE SOURCE

Emergency Medicine

HIS
NATIONAL POISON EXPOSURE DATABASE

Emergency Medicine—Poison Center

DRUGDEX
EMERGINDEX
HIS
NATIONAL POISON EXPOSURE DATABASE
POISINDEX

Hospital Information System—Administrative Office

HIS

Hospital Information System—Operations

CCF
HIS

Immunology

DOWNCAMPUS IBM 370
SDC

Lombardi Cancer Center

HIS
MEDLARS
NIH COMPUTER

Medical School—Admissions and Records

LIS

Medical School—Associate Dean, Students

NONE

Medical School—Associate Dean, Undergraduate

CCF

Medical School—Continuing Medical Education

NONE

Medical School—Dean

CCF
FIN'L AID
LIS
SDC
THE SOURCE

Medical School—Faculty Practice Plan

HIS
SDC

Medical School—Financial Aid

UNIVERSITY FINANCIAL AID SYSTEM

Medical School—Sponsored Programs

NONE

Medicine—Administrative Office

CCF
HIS
LIS
SDC

Medicine—Ambulatory Medical Services

HIS
PASS
SDC

Medicine—Billing and Collection

HIS
SDC

Medicine—Cardiology

HIS
SDC

Medicine Cardiology

NONE

Microbiology

CCF

Neurology

HIS
LIS
NBRF

Nursing School—Graduate Programs

CCF
HIS
LIS

Obstetrics Gynecology

NAT CTR MATERNAL CHILD HLTH EDUC
SDC

Ophthalmology

SDC

Oral Diagnosis

CCF

Pathology

HIS

Pediatrics

AMA-GTE
CCF
HIS
NATIONAL NETWORK OF CHILD DEVELOPMENT PROGRAMS
SDC

Pharmacology

MEDLARS

Physical Medicine and Rehabilitation

HIS
SDC

Physiology/Biophysics

CCF
NBRF

Psychiatry

NONE

Radiation Medicine

HIS
NIH COMPUTER

Radiation Medicine

SDC
Y

Radiology

HIS
SDC

Surgery

SDC